Religion and Science around the World: Review Articles

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KNOWLEDGE, VALUES, AND BELIEFS IN THE SOUTH AFRICAN CONTEXT SINCE 1948: AN OVERVIEW

by Ernst M. Conradie and Cornel W. du Toit

Abstract. In this contribution, an overview of the distinct ways in which the interplay between knowledge, values, and beliefs took shape in the South African context since 1948 is offered. This is framed against the background of the paleontological significance of South Africa and an appreciation of indigenous knowledge systems, but also of the ideological distortion of knowledge and education during the apartheid era through the legacy of neo-Calvinism. The overview includes references to discourse on human rationality (as an implicit critique against ideology), on the use of social sciences in theological reflection, on the teaching of evolution in public schools, on science and religion, and on religion and ecology. The essay concludes with a survey of some of the major voices regarding the interface between religion and science in South Africa.

Keywords: apartheid; contextual theology; human rationality; indigenous knowledge systems (IKS); religion and ecology; South African Science and Religion Forum (SASRF)

The Paleontological Significance of South Africa

South Africa is home to the so-called cradle of humankind, where around 40 percent of the world's human ancestor fossils have been found. Here,

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in the Sterkfontein Caves, "Mrs. Ples," the 2.3 million-year-old fossil *Australopithecus Africanus* was found in 1947 by Robert Broom (1866–1951). The nearly full skeleton of "Little Foot" was discovered here as well. The discovery helped to identify the "Taung Child" already found in 1924 by Raymond Dart. South Africa boasts a number of world-renowned paleontologists who did ground-breaking work in the history of the hominid fossil record, for example, Philip Tobias (1925–2012), who pioneered the excavation of the Sterkfontein Caves in the 1960s. He was also involved in describing the *Homo habilis* specimen, and the "Nutcracker Man," now known as *Australopithecus boiseii*, in Tanzania.

The so-called Bushmen, or San people, are a significant part of South African history and identity. The San also represent a very important indigenous population group that roamed the whole of Southern Africa. One broad study of African genetic diversity completed in 2009 found that the San people were among the five populations with the highest measured levels of genetic diversity among the 121 distinct African populations sampled (Connor 2009).

The Blombos cave in the southern Cape, where excavations started in 1991, has yielded evidence of our forebears that is far older than that of the European Cro-Magnon (c. 35,000 years ago). Blombos artifacts date back to the Middle and Late Stone Age. The evidence indicates periods of relatively brief occupation, separated by long periods of nonoccupation, including a separation between occupation during the Late Stone Age and the Middle Stone Age. Bone tools, marine shell beads, and engraved ochre were found in the first phase; bone tools in the upper second phase; and considerable quantities of ochre and associated ochre working tools in the third phase. A significant finding was the cross-hatched engravings (shades with two or more sets of intersecting parallel lines) carefully etched onto red ochre stones. They were dated as 77,000 years old, twice as old as Stone Age cave paintings in southern France (see Highfield 2002).

South Africa is also the country where the Meerkat radio telescope is currently being built some 90 km outside Carnarvon in the Northern Cape. The Meerkat will be integrated into the midfrequency component of the Square Kilometre Array (SKA), phase 1. The SKA telescope will be the largest and most sensitive radio telescope in the world and will be located in South Africa and Australia.

Given this background, one may expect South Africans to be abreast of scientific developments, how they all fit together, and what importance must be attached to evolution in the narrative of humankind. But this is not the case. In spite of the paleontological importance of Southern Africa, a liberal constitution, a secular state, much money spent on education and some excellent scientists, South Africa does not have a scientifically informed populace. Numerous reports have expressed concerns over disastrous levels of numeracy and literacy and over the unequal quality

of primary and secondary education. The National Planning Commission's *Diagnostic Overview* puts it bluntly: "The quality of education for poor black South Africans is substandard" (National Planning Commission 2011, 13). At the other end of the spectrum, South African scientists and theologians contribute to internationally benchmarked research. However, the demographic profile of such researchers in terms of age and race remains skewed. According to statistical data on the demographic profile of academics with permanent positions at public universities in South Africa released by the Council on Higher Education (2011), staff members classified as "white" still occupied 9,162 out of 16,935 academic positions and 3,652 out of 4,895 professorial positions in 2011, despite belonging to a group that constitute roughly 10% of the South African human population. This suggests an obvious need for the transformation of the higher education sector.

It should also be noted that although there is a wide variety of religions, around 70 percent of the population is Christian, while so-called mainline Christian churches together represent roughly half of the Christians. Most black Christians pragmatically combine a belief in the Christian God with traditional African practices honoring ancestral spirits. The Zion Christian Church, for example, draws more than a million pilgrims each Easter, while literally thousands of smaller groups may be seen on Sundays worshipping in the open (see Müller 2011).

In this contribution, we will offer an overview of distinct ways in which the interplay between knowledge, values, and beliefs has been understood in the South African context since 1948. This description of the task calls for some clarification.

As is the case with any such overview, the rubrics employed necessarily reduce the full complexity and underplay internal differences. However, given the main aim of providing a bird's-eye view, the description and analysis will hopefully be suggestive enough to facilitate understanding.

We opted for the terms "knowledge, values, and beliefs" instead of "science, ethics, and religion or theology" for several reasons. In the South African context, it is necessary to recognize the role of forms of knowledge outside the various sciences, with particular reference to indigenous knowledge systems (IKS). The term "beliefs" includes religious beliefs, but also allows for reflection on pseudoscience, ideology, and superstition, although the main focus here will indeed be on religious beliefs and, given its influence in the South African context, on theological reflection on Christian beliefs. It is also necessary to bring in the term "values," given the way in which the production of knowledge has been shaped and distorted, first by colonial assumptions, then by a form of "Christian nationalism" during the apartheid era, and now, by neoliberal capitalist assumptions, even though this is qualified by concerns over economic inequality. In order to restrict the inquiry, we did not include a discussion of the interplay between

knowledge and values, where this is not shaped explicitly by (religious) beliefs. Any discussion on knowledge and values would need to explore the contemporary corporatization of universities and research agendas. When knowledge becomes marketed and is "for sale," this is clearly crucial, but it is not addressed in this contribution.

We opted to cover the period from 1948 in order to address the impact of the South African form of neo-Calvinism that became so influential with the advent of the apartheid era. The interplay between knowledge, values, and beliefs before 1948 was dominated by the colonial debates on liberalism and orthodoxy that took place with specific reference to the trials of John Colenso (1814–1883), the Anglican bishop of Natal, and Johannes du Plessis (1868–1935), a professor of the Dutch Reformed Church's (DRC) seminary in Stellenbosch. Such debates are not explored here.

We need to add a note that both of us, as authors, were classified as "white" under apartheid, and that we are both male, Afrikaans-speaking, older than 50 years of age and from the reformed tradition of Dutch origin. We are based in the Western Cape and Pretoria, respectively. These demographic features are not necessarily restrictive, but the overview of South African discourse on knowledge, values, and beliefs that we offer here will necessarily be contested and would need to be tested by others against this background.

An Appreciation of IKS in Africa

IKS may be seen as the local and global, formal and informal body of knowledge available in a society and the formal selection that is made from it to train and equip its members to participate in, and contribute meaningfully to, that society. This includes all sources of knowledge, such as cultural traditions (language, religion, morality, IKS, folk wisdom), curricula of educational institutions (including literary sources), the media (newspapers, television, Internet, information and communication technology), the "fixed" knowledge systems existing in all government, commercial and other social institutions, diverse worldviews, and the like.

In South Africa, the focus on IKS is part of a broader initiative to recover African identity. Much money and effort are going into the advancement of IKS. The journal *Indilinga* (African journal of indigenous knowledge systems) is one of a couple of journals recently established to promote IKS. The quest for an African identity must be seen in light of the harm done to Africa due to imperialism and colonialism, Africa's struggle with poverty and illiteracy, and its relative unimportance in world events. Any talk about the "African university" and Africanizing school and tertiary curriculums must be seen against this background. In the same breath, one must ask what is meant by Western science? The universality of science is often contrasted with local reception.

Knowledge systems and their underlying rationality are both local and universal. Emphasizing only the universal dimension is to deny the local diversity and personal creativity embedded in a particular linguistic or cultural milieu. Emphasizing only the local dimension is to deny common human rationality, as well as the hermeneutic capacity to understand. Of course, there are limitations to the range and success of universal rationality, as well as the degree to which we can really understand foreign local contexts.

Recovering Africa's identity cannot imply going back to some supposedly pristine African identity (Pobee 1993, 390). Pobee (1993, 392) finds Africa's identity in present characteristics. African identities are tied into the question of who people, persons, human beings are, and these questions are directly linked to their unique characteristics. IKS can contribute to the restoration of African identity. For Crossman and Devisch (2002, 105), the new discourse on IKS is a social and cultural expression of the quest for identity and participation in a still inequitable society.

IKS must be understood against the critique of the "Western" way of doing science. Enlightenment thinking proclaimed the triumph of reason over recalcitrant nature (Ingold 2000, 27). In this process, reason was isolated as an inherent ability, detached from nature and standing against nature and the natural environment, which is objectified. In contrast, the hunter-gatherer operates with a sentient ecology, where the human subject stands in an active and dynamic interrelationship with his/her environment. The hunter-gatherers' knowledge (IKS) of their environment is not of a formal, authorized kind, transmissible in contexts outside the act of hunting. It is based in feeling, consisting in skill, sensitivities, and orientations that have developed through long experience of conducting life in a particular environment.

Western models of science and rationality are abstract, claimed to be universally valid, and based upon the objectification and scientific domestication of the natural environment. But our knowledge of and interaction with our environment are seldom determined by an exclusively rational approach. Rationality is also influenced by prejudice, intuition, emotion, and all the other factors contributing to our subjectivity. The hunter-gatherer's intuitive under-standing of his/her environment is not contrary to science, nor does it appeal to instinct rather than reason. It is based on perpetual skills that emerge, for each and every person, through a process of development in a historically specific environment. These skills are, for Ingold (2000, 25), a necessary grounding for any system of science or ethics that would treat the environment as an object of its concern.

IKS illustrate the history of a people's interaction with their environment. This interaction manifests itself at many levels and can be typified as a sentient ecology. African IKS are distinguished by their diversity. This diversity mirrors the variety of biogeographical factors determining it.

One-quarter of the world's languages are spoken in Africa. Africa has about 1,500 languages; no other continent approaches this diversity. Africa's diverse peoples resulted from the continent's diverse geography and its long prehistory.

Skill, in preindustrial societies, cannot be disengaged from individuals and their society. A technical skill is a person's property, developed in the context of their engagement with other persons in the environment. Technical skills are themselves constituted within the matrix of social relations. In other words, technical relations in preindustrial societies are embedded in social relations. Skill is not considered an attribute of the individual person, but is constituted by his/her presence in the community (Ingold 2000, 290–91). This is the very reason why African IKS are held in high esteem. They determine an African person's identity and place in the community.

The above should not be interpreted to mean that the South African government is hostile toward science. Its support of international scientific projects, the very generous amount allocated to education, and efforts made to advance the natural sciences are indicative of the value placed on science. IKS, however, is as important, although on a different level.

The Legacy of Neo-Calvinism

The policy of apartheid was introduced in South Africa following the victory of the National Party in the 1948 elections. This policy was a crude radicalization of the British colonial strategy of segregation, blended with the political and – especially – economic interests of Afrikaner nationalism. This policy was introduced with strong support from the DRC, mainly on pragmatic grounds, abstracting from its mission policies based on ethnicity. A theological legitimation of apartheid was required in order to render intellectual and ecclesial credibility to the proposed policy. This was provided on the basis of a South African blend of neo-Calvinism, Princeton fundamentalism, German romanticism, and the emphasis on ethnicity (*volk*) in the missiology of Gustav Warneck and others. This process is well documented in the literature and need not be reviewed here. It may be noted that such a theological legitimation not so much provided an intellectual foundation for apartheid, but served as a retrospective legitimation of policies adopted mainly on pragmatic and not intellectual grounds. Yet, it helped to entrench a particular ideology that made it more difficult to unmask what was at stake (see especially Coetzee 2011).

The philosophical categories employed for this theological legitimation were derived mainly from two neo-Calvinist authors, namely Herman Dooyeweerd (1894–1977) and Hendrik Stoker (1899–1993). Dooyeweerd (1935–1936) developed a "cosmonomic" philosophical system according to which a suite of 15 spheres of society retain their own sovereignty, each in its own sphere. This emphasis on the balance of powers between

government, parliament, jurisprudence, education, the media, and civil society is, of course, embedded in any modern democracy. In the Netherlands of the early twentieth century, this was introduced to allow for religious differences between Roman Catholics and Protestants in structuring culture, education, trade unions, political parties, and so forth in distinct spheres (*zuilen*). This philosophical system was adapted in the South African context to entrench racial and ethnic diversity. In theory, each ethnic group could thus be regarded as sovereign to allow for self-determination on the same range of issues, including the Verwoerdian scheme of a constellation of "independent" South African states (bantustans). Although this philosophy theoretically emphasized diversity, it introduced a rigid and rather ahistorical system that allowed for an oppressive political and economic hegemony.

One may argue that the philosophical architects of apartheid belonged to a small group that was rather isolated and had little direct political influence. However, it did help to shape education policies with specific reference to Christian National Education, which provided the parameters within which education was structured between 1948 and 1990. This had far-reaching consequences for primary, secondary, and tertiary education and the system of values prescribed in all spheres of society. Through the emphasis on Afrikaans as a medium of instruction in secondary schools, it contributed to the Soweto uprisings in 1976.

The notion of Christian National Education was constructed on the basis of a Christian and, more particularly, a reformed (Calvinist) worldview. This was built upon Abraham Kuyper's ([1931] 2007) famous Stone lectures of 1898 and his view that the reign of God needs to be established in every square inch of society. This implies the need to bring the aims and values of education in line with a Christian way of looking at the world. It may be true that Christians see the world in ways that are different from others, but whether a comprehensive worldview may be developed on this basis is debatable—primarily because what we know of the world is changing according to knowledge emerging from the sciences and changes in human societies. Yet, this is what was attempted in various academic centers in South Africa, most notably at the Potchefstroom University for Christian Higher Education on the basis of the "reformed" philosophy of Dooyeweerd and Stoker (see Stoker 1933, 1941). A Christian view of science is supposed to shape not only the aims and values embedded in the scientific enterprise, but also the subject matter itself (see also Heyns and Jonker 1974). It was sometimes pushed to the extreme in proposing that a Christian form of biology (resisting any notion of evolution), and even a Christian mathematics, could be constructed. In later years, creationist thought patterns prevailed in such circles. Since such views on Christian education were fused with the agenda of Afrikaner nationalism (i.e., the dominant way of viewing the world), this perpetually begged questions

about the link between Christian and national education. It is safe to say that insiders defended the Christian character of such education and science, while outsiders primarily recognized the nationalist ideology at work and its devastating consequences in apartheid South Africa.

Philosophical Reflection on Modes of Rationality

The Dutch theologian Herman Bavinck (1854–1921) is often associated with neo-Calvinism, given his sometimes uneasy association with Abraham Kuyper (1839–1920). However, although his theology remained classically reformed and although he also reflected on the notion of a Christian worldview, he recognized that it is necessary to draw on a conversation with philosophy and insights from the various sciences to understand the "whole revelation of God," including God's so-called general revelation. His erudition in other disciplines was indeed remarkable for his time. The English translation of an abbreviated summary of his four-volume *Reformed Dogmatics* is therefore aptly entitled *Our Reasonable Faith* (1956; see also Bavinck 1909).

After the 1950s, a number of South African philosophers who received theological training broadly under the influence of Bavinck developed an interest in issues of rationality. Most of these scholars were related to Stellenbosch University in one way or another. These include Johannes Degenaar (1926–), Hennie Rossouw (1933–), Wentzel van Huyssteen (1942–) and, later, Anton van Niekerk (1953–). Except for Van Huyssteen (1999), their publications on rationality are mostly in Afrikaans (see Rossouw 1980; Degenaar 1986; Van Niekerk 1992; Rossouw 1993).

At first, this interest in issues of rationality was directly related to debates on faith and reason, thus seeking to account for the rationality of the Christian faith in conversation with secularism, scientism, and liberal reductionism. However, as philosophers, their interest went beyond that to reflect on modes of rationality in the human sciences. They were typically influenced by continental philosophy (the legacy of Heidegger and, later, Ricoeur) more than analytical philosophy, and sought a form of "enlarged rationality" that cannot be reduced to empirical observation and logical argumentation, but also included moral, legal, and esthetic dimensions of truth (Degenaar 1986). There can be little doubt that such philosophers self-consciously followed a different path from that of neo-Calvinists and, therefore, established intellectual foundations that undermined the theological and philosophical legitimation of apartheid.

An Emphasis on Social Analysis in Contextual Theology

The Christian Institute was established under the leadership of Beyers Naudé in 1963 to engage in reflection on the social challenges faced by churches in apartheid South Africa. The Christian Institute, together with

the South African Council of Churches, launched a Study Project on Christianity in Apartheid South Africa in 1973 to investigate such challenges on the basis of the collection of social scientific data. The Christian Institute was banned in 1977, only to be followed by the establishment of the Institute for Contextual Theology in 1981, under the leadership of Smangaliso Mkhatshwa (1939–), Albert Nolan (1934–), and Frank Chikane (1951–). By this time, the term "contextual theology" became widely used to refer to theologies that are self-consciously contextual in nature, most notably liberation theology, black theology, feminist theology, and African theology. It was recognized that all theologies are indeed contextual, including apartheid theology and Western theologies that maintained the pretense of having universal validity. The term was therefore somewhat of a misnomer, but helped to foreground the role of social analysis in theological reflection. The approach adopted is epitomized by the famous *Kairos Document,* published by the Institute for Contextual Theology in 1985, with a revised edition appearing in 1986 (Institute for Contextual Theology 1996).

In such discourse on contextual theology, a methodology was widely adopted that followed three simple steps, namely social analysis, theological discernment, and emancipatory praxis. It is usually dubbed the "See-Judge-Act" method, but since it involves theological reflection on emancipatory (ecclesial) praxis, it may best be described as an "Act-See-Judge-Act" spiral of ongoing reflection (see Institute for Contextual Theology 1991). Besides the obvious emphasis on praxis, the interplay between social analysis and discernment invites attention. The social analysis allows for a wide range of social scientific tools to be used, most notably economic analysis. Marxian categories are often employed in such analysis. Indeed, it is safe to say that in South Africa there has been a vibrant discourse on science and religion with respect to social sciences such as economics and sociology, whereas the sphere of influence of debates on theology and the natural sciences is far more restricted.

However, given the "epistemological privilege" assigned to the poor and the oppressed, there was also a need for grassroots involvement in the process of social analysis. The argument is that the poor often understand their own needs better than any outside experts, and also know best how they can be helped to improve their situation, only lacking the capacity to do so. Knowledge is not the prerogative of an educated elite only. Moreover, if God is present especially among the poor, they are in a privileged position to know God (for a discussion, see especially Nolan 1988; Mosala 1989). The methodological priority placed on social analysis begged the questions whether theological discernment does not always influence the analysis already and to what extent the analysis is already value-laden. This is, of course, another expression of the widely discussed relationship between facts and values. The role of beliefs—and the biblical sources from which such beliefs are derived—in judging the significance of such social analysis

is recognized explicitly. The opposite critique is also pertinent, namely that social analysis, if given a methodological priority, may well determine the content of theological reflection. At worst, this leads to a form of "inverse hermeneutics" (see Bosch 1991, 420–32) where the significance of the context for religious discernment was emphasized, while the transformative impact of religious experience was underplayed.

In more recent years, this mode of "doing theology," that is, reflection on ecclesial praxis on the basis of social (and economic) analysis, is reflected in a series of ecumenical documents (usually produced under the name of an organization rather than the individual authors or editors involved). These documents include *The Land Is Crying for Justice* (Conradie, Mtetwa, and Warmback 2002), *The Oikos Journey: A Theological Reflection on the Economic Crisis in South Africa* (Diakonia Council of Churches 2006), *Climate Change: A Challenge to Churches in South Africa* (South African Council of Churches 2009), and others including the Kairos Southern Africa documents *A Word to the ANC* and *The Church Speaks for Such a Time as This*.

One may also mention a vast corpus of literature in the fields of theology and religious studies offering reflections on racism, national reconciliation (in the aftermath of the proceedings of the South African Truth and Reconciliation Commission), violence against women, the HIV/AIDS pandemic, the quality of education, health services, municipal services, climate change, food security, and the triple problems of poverty, unemployment, and inequality. Such literature is typically of an interdisciplinary nature, making use of the full array of humanities and social sciences. It is impossible to offer a review of the literature here but such debates clearly dominate discussions in the fields of religious studies and theology.

The Teaching of Evolution in South African Schools

Freedom of religion is guaranteed under the current South African Constitution, while religious studies dealing with world religions form part of the school curriculum. Since 2008, the theory of evolution has been included in the national curriculum of South African schools. Evolution surfaces very briefly in life sciences as well. Given the history of teaching biology in South Africa, this represents a major change of policy, but one for which an already struggling school system appears unprepared. The creation–evolution debate never arose in school biology prior to this because of the system of Christian National Education under the previous government (see above).

The new dispensation has not thus far witnessed proper science education. Interest in science stimulates interest in evolution, and vice versa. The low levels of scientific literacy among South African children have been demonstrated consistently in three successive international studies

of mathematical and scientific literacy, indicating that a major reform in the school science curriculum is long overdue (Dempster and Hugo 2006, 106, 112). After 20 years of democracy, the poor performance in mathematical and scientific literacy can no longer be laid at the door of Christian National Education only. Scientific literacy, as part of contemporary science education reform within the realm of biology, cannot be achieved without an understanding of the nature of science and biological evolution (see Holtman 2010, 102). This, however, is a challenge facing all African countries. A special report entitled *Africa 2025: What Possible Futures for Sub-Saharan Africa?,* compiled by more than a thousand Africans, argued that the biggest need determining Africa's future is scientific rationality (Gifford 2014, 187).

The views of science presented in the curriculum documents provide an indication of the space allowed in the curriculum for views other than evolutionary ideas. Ambiguity prevails in both documents. The Revised National Curriculum Statement (RNCS) for Natural Sciences defines science as an attempt to understand the natural world through systematic and objective processes of inquiry, which include observation, experimentation, and reproducibility. It identifies steps in the process of constructing scientific knowledge, such as generating hypotheses, setting up a "fair test," collecting data, analyzing and synthesizing data, and drawing conclusions. In this respect, it reproduces a view of science that is based on empiricism. However, the document also places emphasis on valuing traditional and indigenous knowledge systems, making the point that empiricism is but one way of viewing the world. The RNCS does not prescribe a particular approach to teaching science, but invites research into the challenges and opportunities offered by science curriculum development in the South African context (see Dempster and Hugo 2006, 108).

Holtman (2010, 106) observes that we need to be suspicious of what teachers actually teach in the privacy of their classrooms. It appears that since evolution is the last section in the syllabus for each grade level (Grades 10–12), and the weighting for it is very low, teachers avoid teaching that section. Teachers report that they would like to teach creationism alongside evolution so that students get the full picture and not a "one-sided" view of life on Earth. Furthermore, some teachers do regard the teaching of evolution in schools as a personal attack on their religious beliefs. One teacher sums up her rejection of evolution as follows: "I understand their argument but I do not believe it. Large-scale evolution is fictitious for me; there really is no proof; there are gaps in the fossil record. There is no solid evidence for me that things come from other things. The Bible is the justification for origins as it goes step by step. I understand their (evolutionists') argument, but I do not believe it" (see Holtman 2010, 106).

Data from surveys of teachers have revealed that the majority of teachers of science lacked the most fundamental knowledge in the new learning areas. There are still many challenges to face before proper training at school level will take place. The present situation leaves pupils disempowered as far as the basics of science education are concerned. However, without dramatic changes in the school curriculum and proper teacher training, chances are slim that the situation will change.

The Reformed Tradition on Issues Related to Science and Religion: A Case Study

As stated above, the South African school system is struggling to communicate evolution effectively to students, and teachers are not well informed either, some of them being personally unconvinced of its veracity. While the school system has a relatively insignificant influence in furthering a worldview that integrates science and values, church leaders do have influence. The overwhelming impression is that church leaders usually shy away from contentious subjects such as creation and evolution, and when they do deal with the subject, microevolution (intraspecies evolution) is as far as they are prepared to go. In this section, we focus only on one confessional tradition, namely the Reformed tradition, as a case study of changing perceptions around issues relating to science and religion.

The leading white Afrikaans-speaking mainline church is the Dutch Reformed Church, which currently has around 1.26 million members. The predominantly "African" and "colored" Uniting Reformed Church of Southern Africa has around 500,000 members. The Reformed Church (the second largest of the three traditional Afrikaans churches) has 130,000 members.

The DRC released a document on the relationship between church and science on June 27, 2010 (http://www.ngkmp.co.za/nuusflits/verhouding-tussen-kerk-en-wetenskap.html.) This document may be interpreted as being favorable toward science and its findings. The document refers specifically to scientific findings on evolution (theories on the origin of humankind), Big Bang cosmology, climate change, and so on. The document stresses the Reformed tradition's focus on education, which includes the full spectrum of multidisciplinary sciences. God's creation reveals God's mystery and wonder in a special way. The church does not endorse any specific scientific model, as that would fall outside its field of expertise. The Bible is not a science textbook that pronounces on ideas outside its historical context. The church respects the historical context of biblical pronouncements. The belief in a creator God is a stance of faith. The DRC wants to be part of a science–church dialogue within this context. The above-mentioned document may be lauded for trying to accommodate science without discarding its own tradition. The challenge remains

to inform the clergy and aid them in conveying specifics to congregations. The fact that science and religion form part of the curriculum of the DRC seminary constitutes a good start.

A survey was recently conducted by a South African Old Testament scholar, Peet Van Dyk (2013), to determine the opinions of Southern African clergy and theologians (from the Reformed tradition) on evolution and faith, and to assess their degree of knowledge regarding the biological theory of evolution. The study further assessed how they relate faith and the biblical record of creation to the scientific theory of evolution.

The views were sorted into the following categories: young earth creationism; old earth creationism; intelligent design; evolution as a God-guided process that cannot be proven, but could only be accepted in faith; and atheistic evolution, in which evolution is seen as an entirely natural and physical process, without the involvement of any supernatural force. This is a completely secular view of biological evolution, but could partially overlap with the fourth view stated above, depending on whether its adherents merely temporarily suspend their belief in God, while dealing with science (temporary atheism), or are indeed radical atheists.

The study found a positive measurement on the evolution–Bible scale (i.e., reconciling the Bible and evolution), which suggests that most participants from the Reformed tradition in Southern Africa expressed a positive opinion about evolution because they were convinced that evolution is a sound scientific theory and does not necessarily contradict the biblical creation narratives, if these are not interpreted too literally. Van Dyk (2013, 8) found that most participants agreed that evolution is not just a theory; that evolution should be regarded in a positive way, because it is one of the most successful theories of modern science; and that participants, on average, disagreed strongly with the opinion that evolution should be seen as a godless theory that should be rejected entirely. The generally positive view of evolution was, however, not indicative of an informed view of evolution. For example, some believed that "evolution could explain only minor adaptive changes and not necessarily differentiation into different species" (Van Dyk 2013, 5). Of the participants, 14.6% were unsure about the adequacy of the fossil record and 36% thought that it was inadequate. Most participants were ignorant of the finer nuances of the scientific theory of evolution, as is suggested by the fact that they made no distinction between direct and indirect adaptation to the environment. This implies that they did not have a clear view of the fundamental difference biologists make between the Darwinian mechanism of natural selection (indirect adaptation) and Lamarckism, which suggests a form of direct adaptation to the environment (Van Dyk 2013, 5).

Most participants agreed with a teleological view of evolution. Although more than 66% of the participants agreed that this purposefulness in nature could only be accepted in faith and not be proven, the results from other

questions suggest that the implication of this statement was not always appreciated (Van Dyk 2013, 8). The view that evolution should be seen as a process guided by God is, however, contrary to the non-teleological nature of the biological theory of evolution, and participants failed to distinguish between what should be accepted in faith and what can be demonstrated or "proved."

Most participants expressed strong non-fundamentalist views about the Bible by suggesting that the biblical creation record should not be interpreted too literally. Other results from the survey suggest that some participants agreed only nominally with non-fundamentalist views, while secretly harboring some remnants of fundamentalist sentiments. The opinion that the Bible does not necessarily contradict evolutionary science may suggest that at least some participants tried to reconcile biblical and evolutionary ideas (which are typical of fundamentalism).

In essence, the study revealed that most participants were positive about evolution, although they had mistaken views about the finer aspects of evolutionary theory. The results further suggested that there was a general lack of distinction between accepting divine design of the cosmos in faith versus trying to demonstrate or prove such design. It is exactly such a lack of distinction between what belongs to science and what belongs to faith that often becomes problematic in the science-faith debate (Van Dyk 2013, 9).

Discourse on Religion and Science: The South African Science and Religion Forum (SASRF)

Although the SASRF may be the only formal South African initiative to focus on the science–religion interface, many informal talks and events on the topic have characterized South African academic and faith communities over the years. The SASRF was launched in 1993 as a project of the Research Institute for Theology and Religion at the University of South Africa, with Cornel du Toit as project leader and Peter Barrett from the University of KwaZulu-Natal as co-project leader. It is seen as a sister organization of the United Kingdom-based Science and Religion Forum. The idea behind the SASRF was to create a space for South African voices in the science–religion dialogue and to conscientize the religious public about ways of relating science to faith.

The forum's aim is not to present an apologia for the Christian faith, but to inform people of the implications of technoscientific developments for our value systems, humanity, and religion generally. Relatively few ministers of religion keep abreast of the debate, which is seen as unnecessary for congregational discussion. Most science students are given no orientation regarding the relationship between science, values, and religion. Therefore, we are probably justified in saying that the South African community

holds various stances on science and religion, which vary from atheist and new atheist attitudes to creationist and Biblicist views. Some may adopt a secular spiritual approach, while others are well informed.

The SASRF has convened 18 times since 1993 and has published the following proceedings, all edited by C. W. du Toit: *Theology and the New Physics* and *The Action of God in the World* (both 1994); *Nature, God and Humanity* (1996); *Faith, Science and African Culture* (1998); *Reading the Universe through Science, Religion and Ethics* (1999); *Evolution and Creativity: A New Dialogue between Faith and Knowledge* (2000); *Brain, Mind and Soul: Unifying the Human Self* (2002); *Design, Information and Complexity in Creation* (2003); *The Integrity of the Human Person in an African Context* (2004); *Can Nature Be Evil or Evil Natural? A Science and Religion View on Suffering and Evil* (2006); *The Impact of Knowledge Systems on Human Development in Africa* (2007); *The Evolutionary Roots of Religion: Cultivate, Mutate or Eliminate?* (2009); *Homo Transcendentalis? Transcendence in Science and Religion: Interdisciplinary Perspectives* (2010); *Knowing, Believing, Living in Africa: Perspectives from Science and Religion* (2012); and *Chance, Causality, Emergence: Interdisciplinary Perspectives* (2013).

Seminal thinkers in the debate were invited to contribute as guest researchers to the seminars. Among them were two Templeton prize winners, namely Arthur Peacocke and George Ellis. Other participants included scholars such as Keith Ward, Wentzel van Huyssteen, Niels Gregersen, Nancey Murphy, Margaret Wertheim, William Stoeger, and Lewis Wolpert. Prominent South African participants included David Hammond-Tooke and the late Gabriel Setiloane.

The SASRF enjoys considerable recognition at South African universities. The SASRF is included in the South African Joint Conference of Academic Societies in the fields of Religion and Theology, which convenes every three or four years. The 2012 Joint Conference theme was "Knowing, Believing, Living in Africa: Perspectives from the Angles of Religion, Theology and Science," and it left no doubt about the presence of science on the theological agenda. Science and religion form part of the theological curriculum at some South African seminaries, including the Reformed seminary, University of Pretoria, and St John Vianney Catholic seminary, Pretoria.

Up until now, the SASRF has been relatively unsuccessful in attracting black theologians and scientists in significant numbers. This is revealed in the list of contributors to the volumes mentioned above and reflects the current demographic profile of academics and researchers in South Africa. Although the ANC government is supportive of science and is desperately trying to address the shortage of science and mathematics students, one may say that their focus is primarily on the recognition of IKS.

Religion and Ecology

South African scholars and activists have been deeply involved in ecumenical discourse on "Justice, Peace and the Integrity of Creation" since the Vancouver assembly of the World Council of Churches in 1983. However, until the early 1990s, the emphasis was very much on the need for a participatory democracy amid the spiral of oppressive, revolutionary, and repressive violence associated with imperialism and colonialism. Since the advent of democracy and the role played by the Truth and Reconciliation Commission (1996–1998), there has been considerable debate on the need for economic justice, considering the widening economic inequalities. Environmental issues have nevertheless been on the agenda all along, given the environmental toll of apartheid (see Durning 1990) and the squalor that still characterizes the living conditions of the urban poor in South Africa (see Lawson 1992). This prompted an emphasis on environmental justice (see McDonald 2002) and land restoration (see Ramphele and McDowell 1991) – and not merely on the need for nature conservation, given South Africa's famous landmarks.

A South African version of the debate around Lynn White's (1967) famous article on the historic roots of the environmental crisis was initiated by sociologist Jacklyn Cock (1992), who argued that an environmental awareness in South Africa is undermined by perceptions and attitudes reinforced by religious leaders. Since the early 1990s, religious communities have become increasingly mobilized to address issues of environmental justice and, now also climate justice—although this remains a rather marginal movement. In 2005, the South African Faith Communities' Environment Institute was established under the leadership of the "green" bishop, Geoff Davies.

Academic contributions to such discourse on religion and ecology are varied, but there is certainly a strong emphasis on what is termed oikos theology. This draws on the ecumenical root metaphor of the "whole household of God" (*oikos*), which etymologically combines a concern over economic justice, ecological destruction, and ecumenical relationships. This is expressed in three ecumenical documents, namely *The Land Is Crying for Justice* (2002), *The Oikos Journey* (2006), and *Climate Change: A Challenge to Churches in South Africa* (2009). The need to integrate concerns over economic justice and environmental destruction is neatly captured in the "olive agenda" proposed by Steve de Gruchy (2007), in Klaus Nürnberger's (1999, 2011) work and in many contributions by Ernst Conradie (2006, 2011) on Christian ecotheology. Other South African scholars have explored indigenous ecological wisdom (see Setiloane 1995; Daneel 1998), while there is also some interest in an ecofeminist form of creation spirituality influenced by gurus such as Thomas

Berry, Matthew Fox, and James Lovelock (see Ackermann and Joyner 1996; Rakoczy 2004; Van Schalkwyk 2008). All these contributions are informed in one way or another by scientific insights, but they clearly seek to emphasize the role of diverging values in the social construction of knowledge.

A Few South African Voices on the Science–Religion Interface

In international scholarly circles, South African contributions to discourse on knowledge, values, and beliefs are largely associated with two towering figures, namely George Ellis and Wentzel van Huyssteen. Both of them have had a significant influence in scholarly debates in South Africa, as is evident from the section above on the discourse on religion and science. To conclude this essay, it is appropriate to describe their contributions in more detail, while also mentioning other role players in South Africa.

George F. R. Ellis (1939–) is a theoretical cosmologist and an emeritus distinguished professor of complex systems in the Department of Mathematics and Applied Mathematics at the University of Cape Town in South Africa. He coauthored *The Large Scale Structure of Space-Time* (Hawking and Ellis 1973) with Stephen Hawking, and is considered one of the world's leading theorists in cosmology. His main contribution to the field of science and religion is a book entitled *On the Moral Nature of the Universe* (1996), which he coauthored with Nancey Murphy. In 1999, Ellis was awarded the Order of the Star of South Africa by President Nelson Mandela for his outspoken opposition to apartheid, and in 2006 President Thabo Mbeki conferred the Order of Mapungubwe on him. Ellis is also the recipient of the Templeton Prize (2004), presented by Prince Philip at Buckingham Palace, for "Progress toward Research or Discoveries about Spiritual Realities."

Ellis considers science and religion to be compatible, provided that one deals with the mature expressions of religion, and not the fundamentalist religious wings (whose ideas are antiscientific). The reason is that they investigate quite different aspects of the universe and humanity by quite different methods. Science deals with testable, repeatable, universal patterns of behavior of material things; religion deals with issues of meaning, ethics and even, to some extent, esthetics. While some aspects of these issues can be explored by scientific investigation, their core nature cannot, because there are no repeatable experiments that can establish their nature. In any case, the kinds of abstractions used in scientific modeling are inappropriate for this domain, which deals with unique events and with higher level patterns of meaning that are not scientifically determinable. They involve philosophical investigation and thought, where repeatable laboratory experiments are simply not the appropriate method of

investigation. In essence: science deals with "how" questions and mechanisms, whereas religion deals with "why" questions and meaning, and neither can answer the issues dealt with by the other.

Science need not dehumanize us or deny deep aspects of meaning. More human views are tenable that take science seriously, but do not accept that it is the only route to truth and meaning. The humanities and philosophy do not have to be dictated to by science: we can explore each of them in the rigorous way appropriate to that domain of enquiry, acknowledging the strengths and limits of each of these avenues toward understanding the universe in which we live. In that context, science can crucially inform philosophy and the humanities, but not supplant them. Philosophy and religion, in contrast to extravagant scientism, affirm human nature and its value: the worth of the individual. Humans are more than machines.

Ellis considers the following to be his most important contribution(s) in the field of science and religion:

- Pointing out that if you want to make a theory of everything that includes issues of meaning and ethics, you'd better take into account the full range of evidence related to issues of ethics and meaning, and not try to base your theories exclusively on the restricted domain of evidence that can be provided by using telescopes, microscopes, particle colliders, and laboratory experiments. These can't see good and evil, beauty and ugliness, love and hate, or many other things that are deeply important in human life. If you base your worldview exclusively on what can be proved by these experiments alone, of course, you'll end up deciding the universe is meaningless. You will have excluded meaning from the equation before you even started.
- Arguing for a kenotic-based (self-sacrificial) moral realism as a key feature of the way things are. This nature of deep morality is profoundly paradoxical—you get what you most need by giving it up. This sacrificial nature of morality is discovered in the spiritualities of all the major religious traditions. It is a key aspect of a good life.
- Examining, in detail, the concept of top-down causation and how it works.
- Developing a holistic view of how the different sciences interact and relate to humanistic and philosophical views in a way that takes into account both current science and the full depths of humanity, as seen in literature, philosophy, and the various religious traditions.

Wentzel van Huyssteen (1942–) has been the James I. McCord Professor of Theology and Science at Princeton Theological Seminary from 1992 to 2014. His earlier work was on forms of rationality in theological inquiry

(see van Huyssteen 1989). He developed this toward a nonfoundationalist, "transversal" notion of rationality, based on an "evolutionary epistemology" that allows for a multidisciplinary conversation (see van Huyssteen 1998, 1999). He was the chief editor of the *Encyclopedia of Science and Religion* (2003). In 2004, he was selected to deliver the esteemed Gifford Lectures, which led to the publication of his *Alone in the World? Science and Theology on Human Uniqueness* (Van Huyssteen 2006). In his more recent work, he seeks to relate human religious experience and the imaginative symbol-making ability of the human species to the evolution of cognitive abilities that are distinctively human. In this way, he redescribes the notion of the image of God that is so deeply embedded in the Judeo-Christian tradition.

Locally, a number of other South Africans have contributed to the debate. These include the following scholars.

Klaus Nürnberger (1933–) made significant contributions in the 1980s regarding the role of contending ideologies in shaping knowledge and (economic) power (see Nürnberger 1988, 1998). He also analyzed the environmental impact of economic structures through a distinction between the center and the periphery of economic power (Nürnberger 1999). His main work in the field of science and religion is entitled *Regaining Sanity for the Earth* (Nürnberger 2011).

Nürnberger argues that, for centuries, science and faith have been drifting apart. In the process, science lost its transcendent foundations; faith lost its credibility. Science unleashed unprecedented powers without providing a vision; faith became a private pastime disconnected from the real issues of life. In view of the looming economic-ecological crisis, it has become imperative that science and faith find each other again and lead humanity in more wholesome directions. To facilitate interaction between science and faith, Nürnberger proposes the approach of "experiential realism." It avoids metaphysical speculation and reified biblical metaphors. It assumes that reality is open toward a transcendent Source and Destiny (God), rather than closed in upon itself, as in naturalism. It concentrates on the experience of immanent reality (explored by science and attributed by faith to the creative power of God) and the experiential impact of the gospel message (which proclaims God's benevolent intentions for this same reality). The gospel message is based on the biblical tradition, culminating in the Christ event, which is part of cosmic evolution at the spiritual level of emergence. It implies the divine vision (rather than a scientific prediction) of comprehensive optimal well-being that operates like a moving horizon, opening up ever new vistas, challenges, and opportunities.

Augustine Shutte (1938–), a philosopher from the University of Cape Town, is a regular contributor to SASRF events and conducted a Templeton project on values from 2001 to 2004 (see Shutte 2006). It was the centrality of values, in both science and religion, and in the relationship between them, that emerged as the key insight produced by a research

project on science and religion in the South African context, sponsored by the John Templeton Foundation. Both science and religion are human creations, have powerful effects on human life, and are thus subject to human moral judgment. In contemporary South Africa, we have experienced the negative and the positive effect on human flourishing of both science and a scientific culture and also traditional religion of diverse kinds. In this context, South Africa is a microcosm of the world: the dominant scientific and secular culture coexists with the traditional religious culture of the majority of South Africans. Shutte's project indicated both the need for, and the possibility of, marrying the European emphasis on the freedom of the individual with the African insight into the radical interdependence of self and others, to provide an integral view of human nature, which would form a more secure foundation for moral judgments in the spheres of both science and religion.

Peter Barrett's (1934–) engagement in the field of science and theology is centered on a new-style natural theology that seeks to place the knowledge of the world gained from the natural and human sciences within a Trinitarian framework of understanding. From such an approach, a rich doctrine of creation is envisaged, expressible in the form of a grand narrative of the universe in all its beauty and costliness – one that is widely embracing and open to new insights and other traditions, and therefore to reformulation in order to include new truths. As such, it could be relevant to the academic and sociopolitical challenges faced by theologians generally—especially constructive interfaith engagement—and to the development of a uniting vision in South Africa. It draws upon the patristic notion of Son and Holy Spirit as the two hands of God in creation, expressed, respectively, as "deep incarnation" (Niels Henrik Gregersen) and "go-between" activity (John V. Taylor), altogether aimed at the manifesting of beauty. Here, the Spirit's inspiration of human imagination is seen as a key factor in that aim.

Cornel du Toit (1953–) favors a secular spiritual approach to reality and develops a theology from below in the mode of immanent transcendence (see Du Toit 2010). Humans are structured for transcendence because of the structure of the human mind. Although science and religion approach reality from different angles and with different intentions in mind, they cannot be kept apart without falling prey to a schizophrenic lifestyle. In spite of scientific insight, we often revert to irrationalities, superstitions, and supernatural beliefs which may play an emotionally supportive role. In a changing environment, we may outgrow specific irrationalities and replace them with new ones. They seem to be part of our evolutionary development. Religion, spirituality, value systems, and so on play a similar role and fulfill for adherents an irreplaceable function. Perhaps the problem lies with "surplus truths." Surplus truths relate to claims we make that exceed the claims base. We seldom keep to the ambit that the evidence for

such truth claims allows. Surplus truth abuses the power it has to make statements on realms not covered by its research. For example, not finding a gap in our knowledge of the process through which the universe was created does not prove that God does not exist. With reference to the question of truth, it means that there is not only empirical truth based on measurement and tests, but also metaphysical truth and truth based on the foundation of ultimate concerns (religion). Religion is based on a higher and more complex level of human consciousness, where truth appears in some existential mode of our being in the world. Evolution equipped us with a capacity to fathom and seek the transcendent. The human mind is wired for "transcendence." We are not satisfied with the known and are drawn to the unknown, mysterious, and challenging.

Ernst Conradie (1962–) works especially in the field of Christian ecotheology. He has explored various aspects of Christian doctrine where distortions of an ideological or a theological nature may influence an ecological praxis, ethos, and spirituality. Such distortions are exacerbated when the plausibility of the Christian faith is undermined by a lack of "traction" with knowledge derived from science, common values, and esthetic considerations. In successive projects, he explored the content and ecological significance of Christian hope (Conradie 2005a), anthropology (Conradie 2005b), and views on God's work of creation and salvation (see Conradie 2012) on this basis.

Conclusion

In the South African context of severe extremes on a social and educational level, and with a challenging diversity of worldviews and lifestyles, science may serve to bridge opposites. Science acts in this sense as a symbol of hope for a better future for all. But science is not the only or final symbol of hope. The manifestations of the human spirit exceed scientific parameters. Space must be created to accommodate these expressions in various value systems, esthetics, and religions.

The identification of science with Western civilization bred a sense of superiority to other cultures. Hume, Kant, and Hegel, for example, believed that European history was the epitome of reason and characterized non-European peoples as irrational. This attitude was only challenged in the postcolonial era, when anthropologists, African thinkers and theologians highlighted the rationality of African life and thought. Identifying science and rationalism exclusively with Western culture invites African thinkers to demonstrate and develop the distinctive character of African rationality, and feeds the urge to rid Africa of Western cultural domination.

In postcolonial Africa, African thinkers are in the process of tracing their roots. On the one hand, they are reacting against uncritical acceptance of Western culture; on the other, it is impossible to retrieve a bygone culture.

African intellectuals are engaged in archaeological excavation of a lost precolonial culture. Some do not search so far back but find sufficient material in present-day traditions, stories, rites, songs, dance, and customs, which is symbolically and conceptually transformed and applied to current problems. Coming of age in a postcolonial era, these intellectuals are formulating African thinking in response to the limitations of Western traditions, especially the harmful legacies of modernism.

To free oneself from cultural domination, one needs to establish what is constructive and what is foreign and harmful to one's own culture. Freeing oneself from foreign influences is difficult, if not impossible, if this is based only on the unilateral decision of some cultural leader or interest group. To succeed it has to spring spontaneously from all sectors of life. Emancipation from foreign influences implies unanimity on what to keep and what to let go—and such agreement is rare. People usually free themselves from systems that were forced upon them, as happened with apartheid. The question is whether science and technology are foreign to Africa or not. If not, can they be accepted without their implicit Western cultural packaging? Africa's strength and endurance in facing its challenges lie in its spirituality. An African worldview is unthinkable without this spirituality.

Until now, the focus on science and the science–religion interface was perhaps seen as an unaffordable luxury for the poor. Economic growth, increasing urbanization, and continued investment in science education will inevitably bring religious questions to the fore. Against this background, the pioneering work in the science–religion interface may serve as a matrix for further development.

References

Ackermann, Denise M., and Tamara Joyner. 1996. "Earth-Healing in South Africa: Challenges to Church and Mosque." In *Women Healing Earth: Third World Women on Ecology, Feminism and Religion*, ed. Rosemary Radford Ruether, 121–34. Maryknoll, NY: Orbis Books.

Bavinck, Herman. 1909. *The Philosophy of Revelation*. London: Longmans, Green & Co.

———. 1956. *Our Reasonable Faith*. Grand Rapids, MI: Baker Book House.

Bosch, David J. 1991. *Transforming Mission: Paradigm Shifts in Theology of Mission*. Maryknoll, NY: Orbis Books.

Cock, Jacklyn. 1992. "Towards the Greening of the Church in South Africa: Some Problems and Possibilities." *Missionalia* 20:174–85.

Coetzee, Murray H. 2011. *Die "Kritiese Stem" teen Apartheidsteologie in die Ned. Geref. Kerk (1905–1974): 'n Analise van die Bydraes van Ben Marais en Beyers Naudé*. Wellington, South Africa: Bybelmedia.

Connor, Steve. 2009. "World's Most Ancient Race Traced in DNA Study." *The Independent* (1 May). Available at www.independent.co.uk (retrieved 31 October 2014).

Conradie, Ernst M. 2005a. *Hope for the Earth – Vistas on a New Century*. Eugene, OR: Wipf & Stock.

———. 2005b. *An Ecological Christian Anthropology: At Home on Earth*? Aldershot, UK: Ashgate.

———. 2006. *Christianity and Ecological Theology: Resources for Further Research*. Stellenbosch, South Africa: SUN Press.

———. 2011. *Christianity and Earthkeeping: In Search of an Inspiring Vision*. Stellenbosch, South Africa: SUN Press.
———, ed. 2012. *Creation and Salvation: A Companion on Recent Theological Movements*. Berlin: LIT Verlag.
Conradie, Ernst M., S. Mtetwa, and A. Warmback, eds. 2002. *The Land Is Crying for Justice: A Discussion Document on Christianity and Environmental Justice in South Africa*. Stellenbosch, South Africa: Ecumenical Foundation of Southern Africa.
Council on Higher Education. 2011. "Higher Education Data: Staffing." Available at http://www.che.ac.za/focus_areas/higher_education_data/2011/staffing (retrieved 4 December 2014).
Crossman, P., and R. Devisch. 2002. "Endogenous Knowledge in Anthropological Perspective." In *Indigenous Knowledge Systems and the Integration of Knowledge Systems*, ed. Odora Hoppers, 96–127. Claremont, CA: New Africa Books.
Daneel, Marthinus L. 1998. *African Earthkeepers. Volume 1. Interfaith Mission in Earth-Care. African Initiatives in Christian Mission 2*. Pretoria: University of South Africa Press.
Degenaar, Johannes J. 1986. *Art and the Meaning of Life*. Cape Town: University of Cape Town Press.
De Gruchy, Steve M. 2007. "An Olive Agenda: First Thoughts on a Metaphorical Theology of Development." *Ecumenical Review* 59:333–45.
Dempster, Edith R., and Wayne Hugo. 2006. "Introducing the Concept of Evolution into South African Schools." *South African Journal of Science* 102:106–12.
Diakonia Council of Churches. 2006. *The Oikos Journey: A Theological Reflection on the Economic Crisis in South Africa*. Durban: Diakonia Council of Churches.
Dooyeweerd, Herman. 1935–1936. *De Wijsbegeerte der Wetsidee*. Amsterdam: H.J. Paris.
Durning, A. 1990. *Apartheid's Environmental Toll*. Worldwatch Paper 95. Washington, DC: Worldwatch Institute.
Du Toit, Cornel W., ed. 1994. *The Action of God in the World*. Pretoria: Research Institute for Theology and Religion.
———, ed. 1994. *Theology and the New Physics*. Pretoria: University of South Africa Press.
———, ed. 1996. *Nature, God and Humanity*. Pretoria: University of South Africa Press.
———, ed. 1998. *Faith, Science and African Culture*. Pretoria: Research Institute for Theology and Religion.
———, ed. 1999. *Reading the Universe through Science, Religion and Ethics*. Pretoria: Research Institute for Theology and Religion.
———, ed. 2000. *Evolution and Creativity. A New Dialogue between Faith and Knowledge*. Pretoria: University of South Africa Press.
———, ed. 2002. *Brain, Mind and Soul: Unifying the Human Self*. Pretoria: University of South Africa Press.
———, 2003. *Design, Information and Complexity in Creation*. Pretoria: University of South Africa Press.
———, ed. 2004. *The Integrity of the Human Person in an African Context*. Pretoria: Research Institute for Theology and Religion.
———, ed. 2006. *Can Nature Be Evil or Evil Natural? A Science and Religion View on Suffering and Evil*. Pretoria: Research Institute for Theology and Religion.
———, ed. 2007. *The Impact of Knowledge Systems on Human Development in Africa*. Pretoria: Research Institute for Theology and Religion.
———, ed. 2009. *The Evolutionary Roots of Religion: Cultivate, Mutate or Eliminate*? Pretoria: Research Institute for Theology and Religion.
———, ed. 2010. *Homo Transcendentalis? Transcendence in Science and Religion: Interdisciplinary Perspectives*. Pretoria: Research Institute for Theology and Religion.
———, ed. 2012. *Knowing, Believing, Living in Africa: Perspectives from Science and Religion*. Pretoria: Research Institute for Theology and Religion.
———, ed. 2013. *Chance, Causality, Emergence: Interdisciplinary Perspectives*. Pretoria: Research Institute for Theology and Religion.
Ellis, George F. R., and Nancey Murphy. 1996. *On the Moral Nature of the Universe: Cosmology, Theology, and Ethics*. Minneapolis, MN: Fortress Press.
Gifford, Paul. 2014. "African Pentecostalism, Culture and Society." In *Forms of Christian Life in Africa*, ed. Giuseppe Ruggieri, 165–88. Paris: L'Harmattan.

Hawking, Stephen W., and George F. R. Ellis. 1973. *The Large Scale Structure of Space-Time*. Cambridge: Cambridge University Press.
Heyns, Johan A., and Willem D. Jonker. 1974. *Op Weg met die Teologie*. Pretoria: NG Kerkboekhandel.
Highfield, Roger. 2002. "Cave Find Dates Dawn of Creativity." *The Telegraph* 11 January; Available at http://www.telegraph.co.uk/science/science-news/3289646/Cave-find-dates-dawn-of-creativity.html (retrieved 4 December 2014).
Holtman, Lorna. 2010. "The Teaching of Evolution in South African Schools: Challenges and Opportunities." *Biology International* 47: 102–08.
Ingold, Tim. 2000. *The Perception of the Environment: Essays on Livelihood, Dwelling and Skill*. London: Routledge.
Institute for Contextual Theology. 1986. *The Kairos Document: Challenge to the Church*. Revised 2nd ed. Johannesburg: Braamfontein.
———, 1991. *Ten Years of Struggle*. Johannesburg: Braamfontein.
Kuyper, Abraham. [1931] 2007. *Lectures on Calvinism*. New York: Cosimo Classics.
Lawson, Lesley. 1992. "The Ghetto and the Greenbelt." In *Going Green: People, Politics and the Environment in South Africa*, eds. Jacklyn Cock and Eddie Koch, 46–63. Cape Town: Oxford University Press.
McDonald, David A., ed. 2002. *Environmental Justice in South Africa*. Cape Town: University of Cape Town Press.
Mosala, Itumeleng J. 1989. *Biblical Hermeneutics and Black Theology in South Africa*. Grand Rapids, MI: William B. Eerdmans.
Müller, Retief. 2011. *African Pilgrimage: Ritual Travel in South Africa's Christianity of Zion*. Farnham, UK: Ashgate.
National Planning Commission. 2011. "Diagnostic Overview." Available at http://www.npconline.co.za/MediaLib/Downloads/Home/Publications/Diagnostic%20Overview.pdf (retrieved 4 December 2014).
Nolan, Albert. 1988. *God in South Africa: The Challenge of the Gospel*. Cape Town: David Philip.
Nürnberger, Klaus. 1988. *Power and Beliefs in South Africa: Economic Potency Structures in SA and their Interaction with Patterns of Conviction in the Light of a Christian Ethic*. Pretoria: University of South Africa Press.
———. 1998. *Beyond Marx and Market: Outcomes of a Century of Economic Experimentation*. London: ZED Books.
———. 1999. *Prosperity, Poverty and Pollution: Managing the Approaching Crisis*. Pietermaritzburg, South Africa: Cluster Publications.
———. 2011. *Regaining Sanity for the Earth*. Pietermaritzburg, South Africa: Cluster Publications.
Pobee, John S. 1993. "Africa in Search of Identity." In *The Ecumenical Movement Tomorrow: Suggestions for Approaches and Alternatives*, eds. M. Reuver, F. Solms, and G. Huizer, 102–08. Kampen, The Netherlands: Kok.
Rakoczy, Susan. 2004. *In Her Name: Women Doing Theology*. Pietermaritzburg, South Africa: Cluster Publications.
Ramphele, Mamphele, and Chris McDowell, eds. 1991. *Restoring the Land: Environment and Change in Post-apartheid South Africa*. London: Panos.
Rossouw, Hennie W. 1980. *Wetenskap, Interpretasie, Wysheid*. Port Elizabeth, South Africa: University of Port Elizabeth Press.
Rossouw, Hennie W. 1993. *Universiteit, Wetenskap en Kultuur: Opstelle oor die Krisis, Uitdagings en Geleenthede van die Moderne Universiteit*, ed. Anton van Niekerk. Kaapstad, South Africa: Tafelberg.
Setiloane, Gabriel. 1995. "Towards a Biocentric Theology and Ethic – via Africa." *Journal of Black Theology* 9:52–66.
Shutte, Augustine, ed. 2006. *The Quest for Humanity in Science and Religion: The South African Experience*. Pietermaritzburg, South Africa: Cluster Publications.
South African Council of Churches, Climate Change Committee. 2009. *Climate Change – A Challenge to the Churches in South Africa*. Marshalltown, South Africa: South African Council of Churches.

Stoker, Hendrik G. 1933. *Die Wysbegeerte van die Skeppingsidee. Of Grondbeginsels van 'n Kalvinistiese Wysbegeerte*. Pretoria: J.H. De Bussy.
———. 1941. *Die Stryd om die Ordes*. Pretoria: Caxton.
Van Dyk, Peet J. 2013. "The Bible and Evolution: Opinions amongst Southern African Clergy and Theologians from the Reformed Church Tradition." *Verbum et Ecclesia* 34:1–9. Available at http://dx.doi.org/10.4102/ve.v34i1.776 (retrieved 30 November 2014).
Van Huyssteen, J. Wentzel. 1989. *Theology and the Justification of Faith: Constructing Theories in Systematic Theology*. Grand Rapids, MI: William B. Eerdmans.
———. 1998. *Duet or Duel? Theology and Science in a Postmodern World*. London: SCM Press.
———. 1999. *The Shaping of Rationality: Toward Interdisciplinarity in Theology and Science*. Grand Rapids, MI: William B. Eerdmans.
———, ed. 2003. *The Encyclopedia of Science and Religion*. New York: Macmillan.
———. 2006. *Alone in the World? Human Uniqueness in Science and Theology*. Grand Rapids, MI: William B. Eerdmans.
Van Niekerk, Anton A. 1992. *Rasionaliteit en Relativisme: Op Soek na 'n Rasionaliteitsmodel vir die Menswetenskappe*. Pretoria: RGN.
Van Schalkwyk, A. 2008. "Women, Ecofeminist Theology and Sustainability in a Post-Apartheid South(ern) Africa." *Journal of Theology for Southern Africa* 130:6–23.
White, Lynn. 1967. "The Historical Roots of Our Ecologic Crisis." *Science* 155:1203–07.