The Concept of Innovation and the South African Nation

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Abstract

This article follows the birth of the South African nation and how it intersects with the emergence of evolutionary economics as a major academic paradigm. It also recounts virtually all the significant historical phases of South African politics, ideological configuration and industrial development up to the emergence of the knowledge economy. Some of these phases include the segregationist period, the apartheid regime and the current democratic era.

When established disciplinary schools of thought gradually begin to lose relevance and finally experience decisive anomalous moments as in the manner of Kuhnian ruptures, the result is a renewed intellectual excitement as new paradigms and new ways of perception are being countenanced. An example of this is when neoclassical economics as an established paradigm in economics reached a certain theoretical-empirical impasse and consequently became more accepting of alternative paradigms.

Mario Scerri’s *The Evolution of the South African System of Innovation Since 1916* traces the moment when neoclassical economics lost critical valence through the espousal of the concept of innovation as a way of assessing economic performance. There is a hint of this condition...

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in Robert Solow’s neoclassical growth theory (1956) but the actual predictive instantiations of growth through technological innovation remains a ‘black box’ issue. This would be viewing Scerri’s work from a strictly economic point of view. However, this would also prove to be a partial reading of it because Scerri’s analyses are obviously much broader and deeper than this narrow view suggests. Just as we witness the emergence of innovation-systems approach as a credible intellectual paradigm, other interesting historical periods are meticulously revealed – namely, the segregationist era of South African nation-building, the apartheid regime, the extensive waves of industrialisation that occurred during the Second World War, the gradual and excruciating erosion of apartheid and, finally, the emergence of the idea of an implementable democracy. In addressing these various major historical events and eras, Scerri had to reach beyond the strictures of conventional economics into tropes of historiography, sociology and political economy. As mentioned earlier, this book is an interesting analysis of how the South African nation came to be, the wrong turns its rulers took at certain significant points, the often awful consequences of those ill-conceived decisions, and myriad other details concerning the critical phases of nation-building processes in South Africa.

From the context of Mario Scerri’s work, I trace the vicissitudes of the South African national system of innovation beginning from the segregationist period through the apartheid era, the different waves of industrialisation, the professionalisation of research and development activities, the weakening of apartheid by successive outbreaks of internal revolts and rounds of international condemnation, and through the advent of South African democracy. So what is being recounted is not merely a history of national systems of innovation but also the witnessing of an often problematic yet arresting birth of a modern nation.

Before providing a reading of Scerri’s work, it would be necessary to provide a sketch, however brief, of the intellectual background of the concept of innovation. First of all, it is important to stress that the innovation-systems approach is precisely that and not a full-blown theory. It is also pertinent to note that it is largely embedded within the neoliberal/neoclassical paradigm of heterodox economics. Yet it may be argued that the limitations of neoclassical economics lie in its inability to account for rapid technological transformation or processes of innovation.

In addressing the shortcomings of neoclassical economics, Joseph Schumpeter (1942) aved the way for the establishment of evolutionary economics by drawing on perspectives from economic history, statistics,
economic theory and economic sociology (Anderson 1993), and which attempt to explain innovation and technological change. In more ways than one, Schumpeter is more important to the twentieth century preoccupation with innovation as a viable economic concept than perhaps even Karl Marx. This is because rather than just land, labour and capital as the key variables, technological change has become an integral part of economic growth and development. Schumpeter also introduced some key concepts in the study of evolutionary economics such as Walrasian equilibrium which describes a state of stasis within an economy devoid of innovative dynamics.

Other authors such as Richard Nelson and Sidney Winter (1982), and Christopher Freeman (1982, 1987, 1991) Bengt-Ake Lundvall (1992, 2004) and Francois Chesnais (1997) have further explored the concept of innovation as a major variable in explaining economic growth and technological development.

Neoclassical economics encountered a crisis when it could not account for the impressive leaps made by the Japanese post-war economy. Gradually, after the Second World War, economic orthodoxy was considered to be inadequate in explaining the sources and motivations behind economic change. Furthermore, neoclassical economics was inept in accounting for the dynamics underpinning technological development. This paved the way for the study of systems of innovation. Scerri is not concerned with ‘the actual inventions or innovations developed or adopted in South Africa since 1916’ (Scerri:10). Rather he examines the institutional environment in which innovation occurred in the country. And, needless to add, that environment is quite remarkable.

Scerri defines the new field thus:

National systems of innovation can be loosely defined as networks of institutions within the borders established by nation states which determine the economy’s ability to develop and to absorb innovations. These systems are postulated on the basic assumption that technology and innovation, which are defined to include the rules and practices which govern problem solving within a specific social context, are to a significant extent tacit and hence imperfectly transferable across societal and national boundaries (3).

Scerri agrees that there are several definitions of the concept of innovation. However, through academic explorations of the concept, it has become fairly accepted that tacit knowledge plays an important role in establishing systems of innovation and that most nations have rather idiosyncratic histories of development and economic change. Also,
technological capabilities are usually local in nature and thus not often neatly transferable. Accordingly, Scerri points out that ‘the analysis of national systems of innovation is thus an attempt to map out the web of complex institutional relationships that constitute and determine the context within which a nation’s “stock” of technological capabilities and the consequent nodes core competences are shaped’ (ibid:22). Having proffered conceptual vistas by which the study of innovation can be approached, Scerri explains that it is necessary to establish taxonomic grids that are both historically specific and globally legible. He captures this himself more vividly: ‘A taxonomy which has no reference to the evolution of particular systems would be a woefully sterile analytical device while a historical analysis which ignored commonly used definitions and measures would be so specific as to divest itself of a (global) context wherein it can become legible’ (ibid:23).

There are many definitions of innovation some of which are quite broad. Innovation refers to both institutional and technological changes which are novel. Furthermore, they may occur within or outside of research and development (R&D) contexts. R&D is definitely important to the concept of innovation for obvious reasons. In this instance, knowledge spillovers and how the impact on innovative practices in a range of different contexts such as ‘government institutions and tertiary education institutions, and transnational information flows’ (ibid:30) provide a reliable indication of how contemporary stocks of knowledge are constituted. R&D activity also demonstrates how this spectrum of institutions behaves in attempting to amass and utilise emergent stocks of knowledge. For instance, ‘a low level of appropriateness might therefore make it worthwhile for the average firm to let others bear the (often high) initial costs of exploratory research and then to imitate the resulting innovation’ (ibid.). Institutions themselves are influenced in both profound and subtle ways by innovative processes occurring within and around them. There are often unstated rules and expectations underpinning the more clearly expressed objectives of institutions which go a long way in determining their modus operandi. Institutions also exhibit distinctive behavioural patterns as when the Japanese corporation model favours a lifelong hiring policy while the American model follows the practice of ‘hire and fire’. The radical Japanese departure from the American model in fact constitutes what Scerri calls a ‘techno-economic paradigm shift’ (ibid:57). This radical innovation in institutional function is akin to Kuhnian ruptures in the fields of science and knowledge (Kuhn 1970a;1970b).
When innovative developments occur, new power configurations within an institution emerge while older ones may whittle away depending on the play of forces. Or sometimes, old power constellations are merely reinforced. Accordingly, ‘a system of innovation may be identified by its topography of diverse “knowledge stocks”, a mapping of the concentrations of power, of the distribution of knowledge and of the relationships between the various power/knowledge nodes’ (Scerri:37).

Indeed, a sort of Darwinism is evident in the play of power within institutions. However, it ought to be noted that a measure of stability is required for institutions, systems or even state structures to reproduce themselves. This tendency towards reproduction refers to the process of ideological legitimation which goes hand-in-hand with patterns of socialisation. As such, there is a constant tension between the drive to innovate within institutions and the conservative tendency for them to attain the stability required to reproduce themselves. So far, we have been examining how institutions operate in relation to the concept of innovation. However, to apprehend the even broader concept of the national system of innovation, it is necessary to note that this entails a conscious level of integration among the different components of the national policy framework. Scerri indicates that the concept can be problematic: ‘The very breadth of the concept of national system of innovation can easily become the source of its most damaging critique. The plethora of determinants which are tossed into this cauldron and the definitional elasticity of technological capabilities can cover just about every aspect of the development paths nations can take. Thus it may be argued that this catch-all term becomes theoretically meaningless and analytically void (ibid:63). This is the same sort situation that placed development economics in a less privileged position in relation to mainstream theory. The innovation systems approach, on its part, has managed to disengage itself from contestations with neoclassical economics regarding its theoretical suitability and instead focused on deepening its own conceptual field. Scerri reveals that, ‘the concept of an innovation system has, since the nineties, moved from the fringe of economic theory towards the centre, especially with the introduction of innovation surveys’ (ibid:64). This would appear to place it in a better position than development economics.

There is another very important angle to the study of innovation – which is technology. Scerri avers that, ‘technological capabilities can be broadly defined as the capacity to innovate and utilise innovations’, and there are ‘two components of this capacity on the basis of the roots of the word technology- the techni and the logi, the mastery of the “how” and the “why” of a technology’ (ibid:21).
Having explored what the concept of innovation entails let us now consider how it plays out in South Africa beginning from the early twentieth century. In 1918, the Scientific and Technical Committee was merged with the Industries Advisory Board to form the Advisory Board of Industry and Science. This amalgamation, Scerri points out, marks ‘the first attempt to establish a planned system of innovation’ (ibid:110). Germany, during the First World War, had demonstrated what could be achieved if the technological capabilities of a nation are well harnessed to attain dominance in a number of different spheres of activity such as war and economic performance. Germany had also managed to evolve a national system in which human capital could be developed from infancy to the highest levels of academic performance via an elaborate system of training institutions for all grades and for a wide range of national objectives. South Africa, during that period, was impressed with the German achievement and a couple of key South African leaders sought to replicate the German success, at least, in some kind of form. In this regard, a couple of notable South Africans should be mentioned: Jan Smuts and H.J. van der Bijl. Smuts was a scientist and van der Bijl was a technologist and both qualifications would eventually prove to be decisive when science and technology objectives would be combined with an industrial development policy outlook to produce an early instance of a national system of innovation framework.

Jan Smuts was an interesting if rather curious figure. He was a ‘Boer war hero’ and a veritable ‘icon of Afrikanerdom’. He was also a practitioner of geopolitics in addition to being an internationalist. However, he was intolerant of any form of opposition which he duly stamped out. He became the Minister of Mines and supported foreign capitalist interests over his white Afrikaner kin. Scerri captures some of his contradictions; ‘Smut, the traitor to his own people in the service of the British Empire, was also the supporter of mining capital against the proletariat – white workers in the twenties and black workers in the forties’ (Ibid:101). In spite of all this, Smuts had the strong intention of leading South Africa into an assembly of nations that was at the vanguard of modernity and scientific and technological progress. He was prepared to found the institutions to pursue this aspiration. He was also willing to identify and enlist individuals who supported his vision. Smuts was aware that being at the vanguard of modernity and economic progress did not only entail the acquisition of technological prowess but also necessitated political maturity in the form of democracy. Here, another contradiction in the implementation of policy became evident as South Africa operated a segregationist economy based on racial difference. Smuts was able to pursue his objectives when he became prime minister in 1919.
The following year, H.J. van der Bijl was made Scientific and Technical Advisor to Government. In fact, at this stage, South Africa relied mainly on agriculture and the mining sector which provided few opportunities for technological innovations. In 1923, van der Bijl oversaw the establishment of the Electricity Supply Commission (ESCOM), as he believed that one of the surest ways to industrialisation and economic growth was through the availability of cheap and reliable sources of electricity. He is also credited with formulating South Africa’s first national system of innovation policy framework.

Van der Bijl did not believe extractable mineral resources constituted the only way to economic advancement and sought to diversify South Africa’s development path through a more solid reliance on the gains of science and technology. However, van der Bijl was compelled to function under a segregationist paradigm that offered a severely diminished role to blacks within the political economy of the nation. Van der Bijl who also became Director-General of War Supplies established the Council for Scientific and Industrial Research (CSIR) in 1945 with a view to narrowing the industrial gap between South Africa and the industrialised nations. The CSIR’s operational mandate included overseeing R&D activities in governmental institutions and parastatal bodies; undertaking basic and applied research in relation to natural resources and industry; facilitating the involvement of the private sector in prioritised research programmes; developing skilled scientific human capital with a variety of instruments involving material support and also paving the way for career advancement; collating and disseminating the latest knowledge on science and technology coming from abroad; and establishing scientific missions in foreign countries to participate in collaborative research projects.

However, the social sciences and agriculture were not included in its sphere of activities. Eventually, the CSIR’s capacity to function as an R&D coordinating body atrophied as a result of counterproductive apartheid policies. The institution’s ability to coordinate R&D programmes on a national scale was severely undermined and it also lacked the capacity to embark upon long-term strategic planning which is vital for a viable national system of innovation policy framework. During the apartheid regime, the CSIR experienced an emasculation of its functional roles and its institutional power. Scerri writes; ‘the control exerted by central government over the CSIR led to an amplification of bureaucratic norms and structures which progressively restrained the public planning and advisory role of the institution and transformed it into an executor of a largely pre-ordained and fragmentary state policy’(ibid:162). The Ministry of Economic Affairs
became the overseeing ministry for the institution and it became like any other civil service department with the same kind of salary structure. This resulted in acute brain drain as the most enterprising scientists left for better conditions in the private sector or abroad. There occurred a pronounced constriction of its institutional voice which further constrained its ability to undertake its original mandate. The progressive whittling away of the CSIR’s functions continued with the establishment of the Scientific Advisory Council in 1962. Towards the end of the apartheid regime in 1986, it became apparent that the CSIR had failed to achieve the aims of its mission statement and a drastic re-organisation of the institution was deemed necessary and this occurred in the following year (Basson 1996). Apart from suffering from chronic institutional stasis, the institution was also plagued by crippling operational myopia, unattractive salary scales, pervasive underfunding, poorly conceived research objectives as well as the entanglements of various research programmes thereby occluding proper strategic planning. Even before this severe regression of the CSIR, Margaret Ballinger had noticed discrepancies in its mission statement. First, she observed that there was an absence of a social and economic research component within the CSIR’s terms of reference. She also noticed that the development of human capital did not seem to play a central role the CSIR’s strategic plan. This lack would have considerable consequences on the nation’s absorptive capacity of new technological developments. It would also impact negatively on organisational and managerial profiles and techniques. And finally, the combination of these two negative consequences would affect the nation’s ability to compete favourably in global markets. In addition, she also predicted that the country’s internal segregated markets were totally counter-productive to the development of a self-sustaining economy and she also criticised the policy of gradualism favoured by the segregationist administration. Needless to add, Ballinger’s insightful observations were largely unheeded. The CSIR’s role in directing the country’s system of innovation consequently diminished due, in part, to its truncated mission statement and also the failure to heed critical observations such as Ballinger’s.

The segregationist economy that operated in South Africa during the early stages of the twentieth century employed two crucial legislative instruments to enforce its functioning, namely: the Native Labour Regulation Act of 1911 which more or less reduced the status of the black worker to that of a serf and the Native Lands Act of 1913 which divested blacks of prime land. In this manner, blacks were viewed as a ‘non-human resource’ with the contradictory effect of constraining national economic development and also introducing a monopsonistic element to the economy of South Africa.
Before the formal establishment of apartheid in 1948, the government of Smuts and Hofmeyr pursued a policy of gradualism (which Margaret Ballinger criticised) on the question of racial segregation. The African National Congress (ANC) under the leadership of A.B. Xuma had tendered a Bill of Rights in support of universal suffrage to the government in 1943 which the government rejected. Instead the government pushed for a programme of separate development for blacks. But as Ballinger (1969) had powerfully argued, the maintenance of a policy of separate development, on the one hand, and the pursuit of national economic growth, on the other, were a contradiction in terms. Given the global situation at the time and subsequently, it would have been impossible to continue to aspire towards economic pre-eminence which the government wished, while, at the same time, enforcing a policy of racial segregation within the political economy of South Africa. When this was pointed out to the government, gradualism was adopted. In time, as the country’s economy diversified from a reliance on the mining sector and agricultural production towards the activities of secondary industries, it became obvious that there was an acute shortage of skills and technological know-how in the human capital base of the population to support a waxing industrialisation drive.

Instead of switching to a policy of de-segregation as underscored by the logic of capital and industrialisation, apartheid was instituted in 1948. Apartheid has been correctly defined as a predatory state in which ‘the two groups that have been identified as the protégés of the predatory state are whites as a unified racial group and capitalists as a class, excluding the possible participation of black capitalists’ (Scerri 2009:72). This particular social and economic configuration has led to the dominance of the race/class contestation in South African economic history as Scerri informs us. Scerri also argues that there was a marked difference between the segregationist period and the introduction of full-fledged apartheid, as the latter embraced, in a more brazen manner, an evidently anti-modern ethos. As such, the national system of innovation that evolved under apartheid was largely defined by its unabashed retrogressive characteristic.

Due to apartheid’s contrarian position to the winds of liberation and democritisation engulfing other parts of the world, the immediate problem facing the enforcers of the regime was its long-term sustainability. The apartheid regime was buffeted with surges of internal protests just as the international anti-apartheid movement gained vocal and political strength. Scerri writes:
the advent of oil crisis in the early seventies, combined with a resurgence of widespread mass protest and the increasing effectiveness of the international anti-apartheid, marked the start of a crisis, economic as well as political, which was to become endemic to the polity. The eighties saw the escalating crisis of faith in the sustainability of apartheid within the ruling establishment itself, with often erratic and invariably doomed attempts to reform some part or other of an apartheid machinery that was increasingly being seen as obsolete (ibid:149).

A major way the apartheid regime attempted to boost its lifespan was by co-opting blacks to form bantustans which were to become self-sustaining homelands based on ethnic affinity. During the seventies and the eighties, quite a number of bantustans were created by the apartheid administration. They were Transkei (Xhosa), Bophuthatswana (Tswana), Venda (Venda), Ciskei (Xhosa), Gazankulu (Tsonga/Shangaan), KaNgwane (Swazi), KwaNdebele (Ndebele), KwaZulu (Zulu), Lebowa (Northern Sotho or Pedi) and QwaQwa (Southern Sotho). These so-called homelands which were meant to support the apartheid illusion that separate development was both possible and self-sustaining were in fact bastions of inefficiency and corruption but the regime preferred to ignore these ills. The creation of the bantustans is directly related to an elaborate project of ghettoisation of blacks in general. The Bantu Education Act of 1953 and the Extension of University Bill of 1957 were unambiguous instruments to legitimate the inferiorisation of blacks in which case they could not aspire beyond a certain prescribed ceiling under the apartheid system of racial stratification. In addition, blacks were compelled to follow prescribed ‘syllabi, examinations, hiring practices and administrative and financial control along racial demarcation lines’ (ibid:174). The incessant inferiorisation of blacks was in turn encoded within the educational system and in discourses affirming white superiority. This, therefore, justified the brutal economic exploitation of blacks. Eventually, the policies of inferiorisation enforced by the apartheid regime ended up subverting it. This was because after a certain point, the country’s internal markets could not support economic growth. Also, there was an anomalous skills shortage when there were ‘techno-economic paradigm shifts’ as a result of the microelectronics revolution.

The apartheid regime in the face of mounting internal and external opposition embarked on a quest to achieve the diversification of the economy through industrialisation. It also sought to become self-sufficient in as many economic spheres as possible. But the drive to attain higher levels of industrialisation was undermined by acute skills
constraints. The oil crisis of the seventies further weakened the South African economy and on the political front, the regime became even more vulnerable as a result of the 1976 Soweto riots. As the isolation of the apartheid regime deepened it also became more militarised and as such, was able to create a military-industrial complex which became a key component of the national system of innovation. The military-industrial complex maintained a paradoxical posture of shoving the country towards modernity while it was mired in an anachronistic political landscape. In addition, ‘the weapons sector is not an appropriate vehicle for overall industrial development because of its limited spillover benefits and its drain on the fiscus’ (ibid:192). So just as the regime faced severe crises on the political front from both internal and external factors, it also had to contend with an unsupportable economic foundation which ultimately proved deleterious to its hopes for industrial development.

When the centrifugal forces which were beginning to pull the apartheid regime from its core tenets became too much to bear, it commenced on a process to negotiate its exit. As a result, between 1991 and 1994, there was a suspension of strategic economic planning in the nation’s agenda. And so, the national system of innovation inherited by the post-apartheid democratic dispensation was largely an unreconstructed model. The primary task for the incoming ANC administration would be to fashion a new framework that would address the generations of skewed development and also the enormous human capital challenges. During that period, there was a contestation between adopting a Keynesian interventionist paradigm and a neoliberal approach to national development. Eventually, a neoliberal route was taken as enshrined in the Growth, Employment and Redistribution: a Macroeconomic Strategy (GEAR) White Paper of 1996. Many reasons have been adduced for the ANC administration’s choice. First, the collapse of the Soviet Union ushered in a new era of capitalist triumphalism. In addition, the administration apparently did not possess the requisite skills at the time to grapple with the technical and intellectual niceties of its choice. In other words, there were severe limitations in its decision-making processes. When a review of GEAR was conducted in 2001, it was agreed that even though there had been some gains in area of maintaining fiscal discipline, there had been no fundamental transformation of the economic base of the country and the chronic problem of unemployment had worsened along with the attendant challenges of poverty. Accordingly, it was noted that ‘the persistent levels of unemployment are largely due to the inherited shortage of human capital, a shortage that has not been significantly addressed,
in combination with an economic structure which has little absorptive capacity for low and unskilled labour’ (ibid:217).

In essence, GEAR had failed to meet the country’s development objectives. The human capital constraint remained intractable and in 2006 the Joint Initiative on Priority Skills Acquisition was established. The Thabo Mbeki regime then adopted an interventionist approach to the country’s myriad economic difficulties by employing a dual economy scenario. The issues of wealth redistribution and the human capital constraint again came into focus. In terms of macroeconomic strategising, the emphasis has shifted from an attention to natural resources to the knowledge economy. In order to function effectively within the knowledge economy, research and development must address the infrastructure for the acquisition of science and technology and also the spiralling problem of ‘the depreciation of knowledge’ (ibid:233). At the conceptual level, Scerri identifies a crucial problem currently facing development planners in South Africa;

The single-minded drive for immediate macroeconomic stability, in terms of inflation, fiscal caution and a manageable public debt, a relatively stable export-promoting exchange rate has displaced the concern with altering the core elements of the inherently unstable innovation system inherited from apartheid. The failure to read history correctly and to distinguish between fashionable, ephemeral economic paradigms and those which were both theoretically sound and empirically validated has seriously flawed the development agenda of the democratic economy. (ibid:234).

Another issue that urgently needs to be addressed is the human capital constraint that faces the country. As mentioned earlier, there has been a shift by nations from a dependence on natural resources to the knowledge economy. In order to participate effectively in the knowledge economy, copious investments have to be made in human capital which also faces rapid rates of obsolescence as knowledge stocks depreciate.

Scerri’s analyses while avoiding the dead ends of neoclassical economics, static theory and other methodologies of conventional economic theory, manage to locate other important variables necessary for explanations of growth and development such as culture, history and politics within a field of discursive interconnectedness and therefore serve as more powerful as well as convincing explanatory model. He has managed to weave together two separate and yet intimately intertwined narratives; the saga of twentieth and twenty-first century South Africa and its systems of innovation on the one hand, and the evolution of the concept of innovation within a context of paradigmatic rupture on the
other. These two distinctive narrative strands grant Scerri’s work an understandable relevance beyond its original disciplinary location.

Scerri is not really interested in sprouting litanies of de-contextualised statistics as many economists are wont to do. Instead he truly wants to render a story, a narrative about the possibilities for a new economic concept couched in the tumultuous yet remarkable history of the South African nation. Of the two intersecting strands of the narrative, the innovation systems approach has arguably emerged the stronger. Scerri’s account throws considerable light on significant historic developments, projects of modernity, the uses and abuses of institutions, the progressive and regressive movements of human capital, South African economic history beginning from the pre-apartheid era, through apartheid itself to its post-apartheid dispensation. Finally, we have the paradigmatic discontinuities in economic theory starting from neoclassical economics through development economics and the ascendancy of innovation systems approach. The exploration of these trajectories demonstrates why the emergence of innovation systems approach was not only desirable but also inevitable.

In the story Scerri sets out to narrate, interesting characters turn up, the plot unfolds with the rhythmic cadences and structure of an epic littered with multiple incidents of theoretical volte face and a dénouement that is judicious enough to avoid easy answers. Indeed, Scerri’s work contains all the elements of a graphic journey in which previously repressed subjects eventually become citizens and in which a predatory state renounces its brutalising past for the unlimited euphoria and anodyne sensations of de-racialised post-apartheid rainbowism, thereby perhaps, once again, unwisely exposing itself to the bitter disappointments of history.

References