Darwinism and Australia
1836-1914

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Earlier versions of the first three chapters of this thesis have appeared in published form. The full publication details are set out in the Bibliography. Whenever the term 'man' is used here, for example, as in 'man's place in nature' it should be taken to signify that this represents accurately the sense attributed to that title in the nineteenth-century debates and discussions under examination. References to Darwin's book *On the Origin of Species* are always to the first edition of 1859 unless otherwise specified.

Among those who have given me assistance with the preparation of this thesis, first mention must go to my supervisor, Monica MacCallum, who has given me enormous support and encouragement, and shown a commitment to its completion over and above anything that could reasonably have been expected. Others who have been of great assistance include, Wade Chambers, David Turnbull, Rod Home, Andre Czausov, Stephen Alomes and Homer Le Grand. Needless to say, any faults and errors are mine alone.

Barry W. Butcher.
ABSTRACT

This thesis is an examination of certain themes and ideas surrounding the development of Darwinism as an intellectual concept in Australian culture. Beginning with a discussion of the manner in which Australian resources played a role in the formulation and growth of Darwin's ideas, it then moves to an analysis of a number of public controversies and debates around aspects of Darwinism which are seen by current Darwinian scholars as being of central importance. The work of a number of Australian scholars is explored to illustrate the way in which evolutionary theory found its way into the academic and public culture of Australia. Finally, discussion is given over to the way in which evolutionary theory became diffused through all areas of intellectual life.

Among the chief claims made here are firstly, that Darwinism played a significant role in the intellectual life of Australia in the last part of the nineteenth-century and that Australians made significant contributions to the development of evolutionary theory. Secondly, it is claimed that for the history of Australian science to have any real meaning it must be understood in its own terms, here on the periphery, and not as an adjunct to events and happenings at the centre. Finally, it is urged here that Australian science and its growth is not bound to a pre-determined and periodised historical development, but that insofar as it is tied to the history of Australia generally, it exhibits the stresses and tensions of the social context in which it exists.

At all times this thesis should be seen as an attempt at intellectual history, but one seeking to embed that history within a specific social context.
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INTRODUCTION

The discourse on Darwinism has been extraordinarily rich and varied for the last hundred and thirty three years. Darwin's work and its many influences, manifestations and transformations has been considered, it would seem, from every possible point of view; each generation, and each group within the generations, seeing it with different eyes, finding new ways of talking about it, using it and fitting it into their current belief systems. One area which has been given a great deal of attention has been the different ways in which Darwinian ideas have been perceived at different times in different countries and different cultures. Little has so far been done on the response to these ideas in Australia. In this thesis I aim to explore the manner in which evolutionary theory was received, and its impact manifested, in the eastern, most densely populated regions of Australia between 1860 and 1914. Where I have used the term Darwinism it is usually intended to cover the idea of evolution in a general sense, not only as a biological theory but as a world view. I believe that this more correctly captures the nineteenth-century understanding of the issues involved in any discussion of the implications of evolutionary theory. That is, Darwinism was understood by most of those involved in nineteenth-century debates in Australia, in the broad sense of being a theory widely applicable to biological, social, religious, political or moral phenomena. Darwin's Origin of Species very rapidly convinced biologists that evolution had occurred, and this was often its major effect. His own theory on how evolution had come about raised a great deal of discussion, and its concepts, such as 'struggle for existence' and 'natural selection' passed into common currency. However, as a biological theory, evolution by natural selection was challenged from time to time and in different places, by theories such as neo-Lamarckism, orthogenesis, and de Vriesian mutation, and these must also be discussed when some of the later responses to Darwinism are under consideration. In discussing what has been distinguished as 'Social Darwinism' I have taken Robert Young's dictum that 'Darwinism is social' as a guide throughout and declined to make the distinction when treating the debates, controversies and interpretations associated with evolutionary theory in Australia. It is a major claim of this thesis that Darwinism, considered in this broad

sense, was an important feature of intellectual life in Australia; and that intellectual life cannot be divorced from its social context.

The writing of Australian history has until relatively recently been dominated by a concentration on political themes, and explorations of the nature of European settlement and the development of an Australian national culture. Geoffrey Serle's *From Deserts the Prophets Come* traced the growth of intellectual life in Australia and, along with Michael Roe's *Quest for Authority in Eastern Australia 1835-1851*, remains the best known attempt at writing intellectual history in Australia. Because Australian historians have concentrated their attention on the emergence of a local political or national philosophy, other aspects of Australian culture, such as the development of scientific and philosophical institutions, including local Royal Societies, universities and museums, have often been ignored. With a few notable exceptions, the histories of these institutions have been left to be recorded by enthusiasts concerned less with their social impact than with their internal development. It is in the growing corpus of biographies that the influence of intellectual movements is best represented in Australian history. John La Nauze's superb biography of Alfred Deakin, though nearly thirty years old, stands as an example of what might be done, as does John Rickard's more recent study of the father of the Australian arbitration court Henry Bourne Higgins. Scientists have fared less well; the detailed biography of Walter Baldwin Spencer by John Mulvaney and

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John Calaby is a fine achievement, but equally recent studies of two significant figures in the history of Australian science, Ferdinand von Mueller and William Branwhite Clarke are much less impressive.5

The second major claim of this thesis lies in its attempt to overcome the handicaps placed upon writing the history of colonial science by restrictive theoretical models designed to account for the spread of western science beyond its European centre to geographical and intellectual peripheries. George Basalla's 1967 paper outlining such a model may well have been exciting when first published and has undoubtedly stimulated much verbal and written debate since. Its weaknesses - that it is Eurocentric, too universalistic, too linear in its attempted periodisation of the growth and development of science and so on - are well known, yet the shadow of Basalla still falls across the history of Australian science, and historians continue to feel the necessity of addressing the issues it raised.6 The argument advanced here is that such models distort the history of science at the periphery by viewing it from the perspective of the centre, with the result that the writing of that history then becomes an extension of the history of science at the centre. Within a colonial society such as that of nineteenth-century Australia, debates about science exhibited all the variants of opinion that characterised the same debates at the centre. When individuals could travel from Britain to Australia in eight to twelve weeks (and books and journals likewise) a question mark must be placed against claims that the continent, distanced by half the globe from its cultural centre, was equally distanced from the intellectual life of the centre. The kind of periodisation found in Basalla is not useful when dealing with the spread of


Darwinism in Australia, for individuals and groups can be found occupying every point on the spectrum of opinion on the question of evolution at any one moment in time. There were convinced Darwinians in Australia in the 1860s and 70s, for example, as there were in Britain and elsewhere, some of whom did fine work in promoting and exploiting evolutionary theory in their own areas of interest. Anti-Darwinism may have been dominant in the institutions of science in the early years, but this was due to the particular history of the Australian colonies and was not the result of colonial backwardness or the iron grip of a predetermined process of periodisation of the sort defined by Basalla. The material progress of the Colonies of Australia after the discovery of gold led to the creation of universities and other scientific institutions in the decade prior to the advent of Darwinism. These were manned by scholars from within an older scientific tradition, whose longevity effectively locked out serious debate on evolutionary ideas from the formal teaching of those institutions for more than two decades (see Chapter 3 for a discussion of this issue).

The last major thesis advanced here, and one that flows directly from the other two, is that scientists in Australia, while often working to agendas set elsewhere, were not so constrained by those agendas as to be incapable of making original contributions to the development of evolutionary science. This is perhaps more obviously true of the latter years of the period under analysis, but nonetheless as early as the first decade of Darwinism, Australian evolutionists were already winning world wide acclaim for their contributions to social and biological theory (see Chapter 5 especially). In essence this degree of originality allows for a historical analysis that is not merely subservient to the interests of the centre; Australian scientists have their own story to tell and the history and fate of scientific ideas at the periphery has to be seen as more than a delayed re-run of debates played out elsewhere.

A QUESTION OF DEFINITION
Investigating the response of a community to a concept like Darwinism would seem to require that some attempt be made to define the term. This is a task fraught with problems. At one level, Darwinism might refer to a particular mechanism for evolutionary change involving a number of key concepts such as competition, variation, and selection. At this narrowly defined level, it is difficult to assess the historical impact of the idea except in a severely circumscribed analysis of scientific developments. Yvette
Conry premissed her account of the introduction of Darwinism in France by defining Darwinism in just this way and as James Moore points out in an admiring review of Conry’s book, the result is more an account of the non-introduction of Darwinism to France. Conry’s problem lay in the peculiarities of French history, in which ideas of transformisme, with its components of progressionism and teleology, were part and parcel of philosophical thinking (though not in general of biology, at least until Buffon and, later, Lamarck). Darwinism in the narrower sense, where chance variations play a crucial role, stands in contrast to this way of thinking. In the Anglo-Saxon world the idea of progress was widely accepted through its association with the philosophical thought of Locke and the historiography of Hume in particular, and was diffused through a whole range of areas such as history, literature and the romantic ideal of the perfectibility of man. It was not so universally accepted in the natural sciences where Charles Lyell had at one time rejected the type of progressionist interpretation of the palaeontological record promoted by Adam Sedgwick and Roderick Murchison and others of the catastrophist school. Lyell’s massive critique of Lamarck in his Principles of Geology satisfactorily disposed of biological progress and evolutionary speculation in the eyes of many. Robert Chambers’ Vestiges of the Natural History of Creation may have struck a responsive nerve with some, but few if any scientifically-minded thinkers took it very seriously, including Thomas Henry Huxley whose devastating review of a later edition suggests that an evolutionary scheme for the history of life, the universe and everything needed something more than popular appeal to make it scientifically palatable. Just possibly, the lack of progressionism in Darwin’s theory may have made it more palatable to British scientists, especially those influenced by Lyell. Darwin was faced with the need to convince a generally unwilling scientific audience of two things. On the one hand that evolutionary change was a feasible alternative to the static view of life forms, and on the other that he had a plausible mechanism for such

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8 Charles Lyell, Principles of Geology, 3 volumes, (London: John Murray, 1830-33), volume 2.

change. In the event, he largely succeeded with the first and failed with the second.

What is it, then, that is being responded to when Darwinism is the issue under discussion? As already indicated, Darwinism might be understood narrowly as a mechanism for evolutionary change or more broadly as a new way of looking at the world. Peter Bowler for one has suggested that, from a scientific perspective, discussion in the 1860s centred around (a) the basic idea of transmutation, (b) the principle of naturalism, (c) the concept of branching, adaptive evolution and (d) natural selection. The problem with these concepts is that they were of necessity all discussed not as isolated matters but within a pre-existent system of belief. This is as true of the Australian discussions as it was elsewhere. However, as Darwinism is being understood here in a broad sense, it is particularly important that the social dimension of these discussions be recognised. When considering the dissemination of scientific ideas, it pays to keep in mind that scientists, too, have non-scientific beliefs, which are not kept in a separate compartment in the brain from scientific ideas, and that scientists like the rest of us, are affected by the climate of opinion that prevails around them. Furthermore, the reception of ideas is not a passive matter. New ideas, if they are to be accepted, need to be actively integrated into a complex web of belief, and if rejected are rejected from the complexities of such a web, conscious or unconscious. In his analysis of the Cambrian-Silurian dispute in nineteenth-century British geology, James Secord states his belief that 'past science can best be approached from the standpoint of general social history, as the product of particular people working in particular places in particular circumstances'. With allowances made for the fact that the issues and the social context are different, much the same approach is taken here.

In any event, discussion of the concepts set down by Bowler was severely circumscribed by a chronic lack of the empirical evidence necessary to settle issues one way or the other. What, then, can be made of George Daniels claim that it was natural selection 'that ultimately

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10 Peter Bowler, 'Scientific Attitudes to Darwinism in Britain and America', in David Kohn, op. cit, note 1, 641-68.

compelled belief’ in evolutionary theory in America? Was it natural selection that convinced Darwin’s greatest American supporter, Asa Gray, for instance, of the truth of evolution? The answer is yes and no. It was natural selection in Gray’s terms, which included a strong teleological component, not in Darwin’s terms, which, as the correspondence between them on the issue shows, explicitly sought to exclude such a component. In short, Gray’s acceptance of Darwin’s theory (and this is one of many valuable insights provided by James Moore) occurred because it could be fitted into a pre-existing web of religious and philosophical thought. In other words, concepts which seem to be easy to define, such as natural selection, are in fact plastic enough to be moulded to fit a pre-existing belief system. Equally, their implications are plastic in that they, too, can be interpreted in more than one way and can therefore be accepted or rejected according to whether they are congruent with a pre-existing belief system.

What, if any, common features can be discerned in a comparative analysis of the reception of Darwinism? One suspects that few scholars would now want to make specific claims as to why Darwin’s work was accepted or rejected by a given scientific community, settling instead for more generalised claims that almost by definition set the discussion into a wider social context. As an illustration of this, take Alfred Kelly’s discussion of the popular reception of Darwinism in Germany. According to Kelly, in Germany Darwinism ‘found its home within a matrix of materialism, radicalism and scientific popularisation’. Now while it is unlikely that this particular matrix is present in all cases of reception exactly as Kelly spells out for Germany (and Kelly is dealing with the popular reception, not specifically the scientific, though the distinction is not always clear in his work or indeed in many reception studies), there are reasons for thinking that some such combination of factors was usually if not always present when Darwinism was under discussion. The volume of essays edited by Thomas Glick,

12 George Daniels, *Darwinism Comes To America*, (Massachusetts: Blaisdell Publishing Co., 1968), xii-xiii.


along with the section on reception in Kohn, the work of Carl Berger on Canada and Adela Ziadat on the Arab world strongly suggest that this was the case.\textsuperscript{15} And it certainly accords with the Australian situation. When Kelly adds the, by now all too familiar, point that opposition to Darwin came largely from religious and secular elites, who denounced it variously as atheistic, socialistic and immoral, the case for analysing the reception of Darwinism in social terms seems overwhelming\textsuperscript{16}.

Accordingly, the approach to the question of defining Darwinism taken here is, as intimated earlier, based on Robert Young's dictum that 'Darwinism is social'. Accepting that modern scholarship is now prepared to entertain the likelihood that both the form and content of Darwin's theory were strongly influenced by social factors, it seems reasonable to assume that debates around it were also social in character. Even when the matters under discussion might appear to be overwhelmingly scientific (for example, in the latter sections of Chapter 3 and in Chapters 7 and 9 here), only by situating that discussion in the social milieu is a full historical analysis possible. Perhaps the term 'social history' is vague and imprecise, but it has the merit of promoting an image of a continuing discourse carried on at different levels, and of a discussion drawing on and feeding into a matrix of social features - religious, historical, political, economic and so on. 'Darwinism', narrow or broad, was never likely to be a topic discussed and debated in dispassionate terms according to scientific norms and practices where empirical evidence could be evaluated in order to decide great and weighty matters.

THE PROBLEM OF A 'CLIMATE OF OPINION'.

In her pioneering paper on the reception of Darwinism in Australia published in \textit{Victorian Studies} in 1967, Ann Mozley quoted John Passmore to the effect that the term 'climate of opinion' might be applied to the idea that in any community, at any particular time, certain habits of thought prevail. There is a network of established opinion the


\textsuperscript{16} Alfred Kelly, op. cit, note 14, 143.
truth of which everybody takes for granted.\footnote{Ann Mozley, "Evolution and the Climate of Opinion in Australia, 1840-76", \textit{Victorian Studies}, June, 1967, 411-30.}

Cynthia Eagle Russett, in her study of the intellectual response to Darwin in America, says in a similar vein that a climate of opinion can be taken to mean 'the ideas held by the majority of the common people of a period'.\footnote{Cynthia Eagle Russett, \textit{Darwin in America - The Intellectual Response, 1865-1912}, (San Francisco: W. H. Freeman and Company, 1976), viii. Russett makes it clear that she is unhappy with this definition.} Such definitions, more intuitive than empirical perhaps, are intended to provide a picture of the social and intellectual conditions of a given milieu into which 'new' ideas such as Darwinism make their way.

Mozley describes the climate of scientific opinion in Australia prior to Darwin as being centred around the British tradition of natural theology. In a general sense this is clearly correct, but it should not be assumed that a climate of opinion precludes dissent from such opinion. The pre-dominant attitude may have predisposed most Australian scientists to opposition to evolutionary theory in the 1860s and 70s, but as indicated above, there were evolutionists in Australia at the same period. Australia in the 1860s was a chaotic society; post-convict settlement was booming, colonial identification growing and cities like Sydney and Melbourne rivalled any in the world for growth and brashness following the great gold-rushes of the 1850's. Religious discord existed over doctrine and the role of the Church in politics and education. In brief, there was plenty of room for the appearance of micro-climates of opinion and the growth of heterodoxies associated not only with fringe or radical groups but often with influential individuals situated in the mainstream of cultural life.

SIMILARITIES AND DIFFERENCES IN THE RECEPTION OF DARWINISM.

If there is one general factor that comes close to being common to all studies of the reception of Darwinism, it is the association of the acceptance of Darwinism with the notion of social change. Such change is inherent in the matrix suggested by Kelly as being the home of Darwinism in Germany.\footnote{Alfred Kelly, op. cit, note 14, Epilogue.} Alexander Vucinich ties intellectual
enthusiasm for social and political reform in Russia with equally enthusiastic acceptance of Darwinism;\textsuperscript{20} Adel A. Ziadat couples acceptance of Darwinism in the Arab world partly, though not exclusively, with the push for Westernisation,\textsuperscript{21} while in Japan Eikoh Shimao sees Darwinism arriving during 'a period of transition from the Shogunate to the Emperor's regime, from feudalism to capitalism ...'.\textsuperscript{22} Even in Finland it appears that it was reformers looking for social change who were the first to take up Darwin in the 1860s.\textsuperscript{23}

It is of course the national differences that occur in the acceptance or rejection of Darwinism that are of the greatest interest to historians. While it may be true that Darwinism became part of a larger discussion involving, among other factors, materialism, free-thought, the writings of Haeckel, Huxley, Buchner and Spencer, and the push for a science based on the tenets of naturalism, the nature of that discussion will exhibit national differences. One way to illustrate this is to look at the reception of Darwinism in Australia's northern hemisphere colonial counterpart, Canada.

According to Robert J. Taylor, four major figures dominated the early debates over evolutionary theory in Canada, all of them opposed to the doctrine. Natural selection to them was 'an insurmountable barrier' (compare this with Daniel's claim about the situation in America mentioned earlier). The most prominent of the four was James William Dawson, a geologist with an international reputation unmatched by any contemporary Australian natural scientist in the first decades after the publication of the \textit{Origin of Species}. Carl Berger claims that Dawson's battles against Darwinism stemmed from his distrust of what he believed to be the faulty methodology that underlay it, namely the departure from the 'Baconian ideal'. Dawson suffered heavily for his anti-Darwinism, being effectively isolated from the mainstream of science in Britain for instance, by the rejection of scientific papers and refusals to publish his


\textsuperscript{21} Adel A. Ziadat, op. cit, note 15.

\textsuperscript{22} Eikoh Shimao, 'Darwinism In Japan, 1877-1927', \textit{Annals of Science}, 38, (1981), 93-102. The quote is on page 93.

\textsuperscript{23} Anto Leikola, 'Darwinism in Finland up to the 1880s', \textit{Uppsala Newsletter for The History of Science}, Volume 2, Number 1, Spring 1986, 5.
lectures. Now a similar situation did arise in Australia (see Chapter 3) but in that case the scholar involved, George Britton Halford, gained locally from his opposition to evolution even if he appears to have lost internationally in terms of reputation. Dawson, like Adam Sedgwick’s protege at the University of Melbourne, Frederick McCoy, had little to gain by his opposition, being an established figure in Canadian science. One can only see Dawson’s anti-Darwinian stance leading to loss of professional prestige.

The second major front of opposition to Darwin in Canada stemmed from a concerted Catholic hostility to what was perceived as materialistic science, of which evolutionary theory was taken to be a part. Opposed to this group was a largely protestant section of scientists, not Darwinians by any means (Dawson being one), but desiring to defend science as a legitimate activity. In some senses then, this was a manifestation of a religious dispute, but while the Catholic group associated Darwinism with materialistic science and rejected it on those grounds, the second group rejected both the accusation of materialism, and invariably, Darwinism as well. In Australia there was little division along denominational lines between supporters and detractors of Darwin among Protestants. However, the problem of materialism in science did become an issue as the discussion over the question of protoplasm in Chapter 4 illustrates. As a general observation it looks as if all those associated with the upper echelons of the established churches were initially opposed to Darwinism, but within the different denominations individuals might take part in debates on opposing sides (although there does seem to have been an anti-Darwinian consensus amongst Catholics, albeit expressed with varying degrees of hostility). There also seems to have been a greater association of freethinkers with evolutionary theory in Australia than in Canada, surely, though for reasons still unclear, the result of different historical developments.

One might go on with this sort of comparative analysis; some of the differences might seem trivial, but taken in toto they effectively add up to different responses. Every country responded to Darwinism

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according to its own history, traditions and scientific and social maturity. In this respect at least Australia was no different from any other.

DARWINISM IN AN AUSTRALIAN CONTEXT

The Australia that Darwinism entered in the 1860's and beyond was vastly different from the Australia which Darwin himself had found in the 1830's. In just three decades the colony of Victoria had been settled and Melbourne, no more than a small settlement in 1836 (and not visited by Darwin) had become the largest city in the continent. The discovery of gold brought wealth and a population explosion along with the construction of an elaborate cultural and social life in many ways more British than that of Britain itself. The great markers of sophisticated social development were already present in New South Wales, Tasmania and Victoria, government structures at many levels up to elected colonial parliaments being the most obvious. What might be termed the secondary markers such as theatres, museums, and philosophical and scientific societies were also present, as were universities in Sydney and Melbourne. The constant inflow of people, books, journals and letters meant that the cultural lag between centre and periphery was rarely more than three months; it is doubtful if intellectual life in the eastern colonies of Australia was in any way inferior to that of some British provincial cities. The 'tyranny of distance' may well tyrannise Australian historians more than it did in reality those whose history is being studied.26

There are of course differences, and significant ones at that, between the culture of Australia and that of the centre from which it sprang and drew nourishment. The population for all its rapid growth was still small; the consequences of that can be observed in the equally small numbers of individuals actually involved in making and sustaining intellectual culture in Australia. Professional scientific bodies were in the 1860s still few, centred on the universities, geological surveys, botanical gardens and observatories, each staffed by small numbers of individuals.27 One result of this was that science was still an area of life

dominated by amateurs, and remained so almost until the end of the century. Given this fact, the impact of ideas such as those associated with Darwin's name is bound to be different from that uncovered in countries where science was already well down the path to professionalisation and specialisation. One cannot really apply to an Australian context a method of analysis which depends on distilling out some essence of Darwinism and exploring the impact of that essence on individual scientific disciplines. In Australia, zoologists tended to be botanists too, palaeontologists zoologists, geologists anthropologists and so on. There were, until very late in the century, no specialised professional bodies beyond the societies devoted to individual disciplines certainly, and these were dominated by amateurs who might well be members of several such bodies.

It is, then, the impact of Darwinism on the wider scientific and social culture that is explored here. There is no attempt made to chronicle and describe every aspect of the process of reception; others have covered some areas sufficiently to allow them to be left out. Nor is there any attempt to keep strictly to a chronological account, although overall there is, for reasons that must be obvious, a time line that leads roughly from earlier to later. What is intended here is an exploration of how and why certain debates occurred, what these debates illustrate about the situation in Australia at particular times and whether and how they throw any light on long held assumptions about the nature of intellectual life in nineteenth-century Australia. Some of these assumptions are explicit, others unspoken but accepted. Some are of a kind which makes them part of a wider network of assumptions - the Basalla model and its successors, for example.

The first two chapters deal with the relationship of Darwin personally with Australia and its scientific resources and the role that relationship played in the construction and development of Darwin's theory. The discussion there leads into chapters which discuss crucial issues surrounding Darwinism and the responses of Australian social and intellectual elites to them. Following this are two chapters which look in some detail at Australians who engaged evolutionary theory in work which drew praise not only within the continent but internationally as well. These chapters are then followed by one which attempts to place

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discussion of the anthropological strands of Darwinian doctrine accurately within current discussions going on within the field of Darwinian studies. The final three chapters explore the impact of what might be termed the second wave of Darwinism, from the 1880's to the outbreak of the First World War; the influence of an evolutionary world-view on the life and work of one particular individual, the influence of visiting scholars and the influx of a new group of academics trained in Darwinian theory and generally holding to an evolutionary perspective, and so forth.

Overall then, this is an attempt at intellectual history written within a social context, a history which is concerned to situate analysis in human affairs rather than in a history of ideas framework which would see such affairs as, at best, secondary to the ideas themselves.
CHAPTER 1

DARWIN’S USE OF AUSTRALIAN MATERIAL, 1837 - 1882

Most reception studies begin, understandably perhaps, from the standpoint that Darwinism flowed outwards from the centre (Britain) to be received or rejected at the far flung outposts of science. The traffic in knowledge is thereby seen as being explicitly one-way: when ideas and information do flow into the centre from the periphery, historians treat this material primarily as raw data, devoid of the intellectual context of its provenance, that is, as nothing more than grist for the Darwinian mill. This may be justified in some instances: for example, the Galapagos finches and tortoises are Darwin’s in a very real sense; and the flow is one way from Darwin’s observations at the periphery to the biological theoreticians at the centre in the late 1830s; to be interpreted by Darwin himself as part of his program for formulating a reasonable explanation for species formation. It is quite otherwise when we consider the flow of information from Australia where there were resident scientists from the beginning of white settlement and the observations were made (with few exceptions) not by Darwin and brought to the centre, but seen through the eyes of others and reported back to the centre already interpreted through a set of pre-existent theoretical predispositions.

What is peculiar about the form of historical analysis which sees only a one way traffic of ideas is that it does little or no justice to the facts. Darwin himself did not see his empirical data as being divorced from a theoretical frame, as even the most cursory reading of his letters and notebooks makes clear. He always tried to read that data not only for its immediate usefulness but in terms of its place in the wider theoretical structure he was building. And this is indeed what his informants in Australia did also - so the data they sent him was by no means raw but already interpreted in various ways, according to the theoretical background of the observer.

One way of approaching this problem is to see it in the light of Bruno Latour’s analysis of the way a centre gains knowledge of a distant

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land by means of 'cycles of accumulation' and 'centres of calculation'. Latour's accumulation cycles make knowledge gained at the periphery accessible to the centre. To achieve this, materials gathered at the periphery must be rendered mobile (for example coastlines and mountain ranges cannot be carried anywhere but maps and diagrams representing such physical features can), they must be stabilised so that they do not decay (plants and animals must be preserved), and finally they must be in a form such that those at the centre can combine them to give a total picture (as for example, diaries and reports, which describe where on the map a plant was found and in what circumstances). Meet these conditions, says Latour, and 'a small provincial town, or an obscure laboratory, or a puny little company in a garage that were as weak as any other place will become a centre dominating at a distance many other places'²

Now in the case of Darwin and his relationships with Australia some points need to be made when assessing it against Latour's thesis. Firstly, by the mid nineteenth-century Australia was already settled by Europeans so that to some extent the flow of materials and information was between two centres. Secondly Darwin did not normally receive 'material stuff' in animal, mineral and vegetable form but rather as information, so that the conditions demanded by the first and third of Latour's propositions were already to a large extent met. That is, there were already centres of calculation in Australia, albeit limited in scope, resulting from Australian cycles of accumulation. As a contrast, compare this with Richard Owen's situation at the British Museum where real 'material stuff' in the form of bones and fossils was constantly streaming in and had to be classified before any real use of it could be made. Both Down House and the British Museum were centres of calculation where incoming material was reduced to a manageable form and sorted and re-sorted to yield scientific knowledge. Darwin had only to shuffle his material in such a way that it served his purposes at any given time and he could then mobilise this re-shuffled material in defence of one of the most powerful theoretical models ever constructed, one which laid claim to explaining the entire development of life through space and time. A considerable part of his material came from the Australian

centres of calculation mentioned above, and the description that follows of the ways in which this was used by him illustrates in part how he was able to build a centre of calculation at Down. More will be said about this later; the task now is to look at the nature of the Australian material that came Darwin's way.

Australia provided Darwin with resources which were always seen by him in relation both to his theoretical concerns at any given time and to his recognition of the peculiar status of the continent. To make it easier to grasp the importance of this approach I have broken up the forty plus years over which Darwin made use of Australian resources into three periods. For each period material has been selected to illustrate the particular manner in which Darwin went about gathering and sorting it. Where possible, an attempt is made to make sense of that material by assessing it against the later outcomes of debates as illustrated in Darwin's published work. Australian resources alone rarely provided the solution to crucial issues; Darwin always gathered data eclectically, and in the final analysis his published work exhibited that eclecticism.

The years from 1837 to 1844 constitute what may be termed the 'crucible period'. At this time Darwin was struggling with the earliest attempts to formulate his theory. This struggle may be traced in part through the Transmutation Notebooks, written between 1837 and 1844 and now seen as a cornerstone of Darwinian scholarship. These are often difficult to interpret and understand; they were designed for Darwin's eyes only and document the often chaotic (and serendipitous) nature of his activity at the time. They contain numerous references to Australia and its natural productions, and many of these will be detailed to highlight the uses Darwin made of the material he referred to.

The second period begins with the commencement of Darwin's friendship with the botanist Joseph Dalton Hooker in 1844. It coincides also with the writing of the famous 'Long Essay' which Darwin intended to have published should he die before completing his 'big species book'. Through Hooker, Darwin was able to reach out into many areas of crucial importance for the development of his ideas especially as they related to Australia. Perhaps no less important was Hooker's role in introducing

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Darwin to Australian scientists and collectors. From his base at Kew Gardens, Joseph, along with his father William Hooker, built up an impressive worldwide network of correspondents, especially those engaged in the colonial Botanical Gardens; Darwin was able to use this network and as a consequence received much valuable material from colonial sources. It is possible to assess this period against Latour's thesis, because Kew was already a sophisticated centre of calculation in its own right and the relationship between Darwin and Hooker was not a simple one of patron and client. Concentrating on the relationship with Hooker in this period makes it possible to get the flavour of what was often an intense scientific and social relationship. Darwin had a high regard for Hooker's judgement and bombarded him with queries over the period leading up to the publication of the Origin of Species in 1859. Hooker in turn often used his knowledge to force Darwin to modify or rethink many of his ideas. While this is often designated as Darwin's 'barnacle period', during which he undertook his detailed studies of the cirripedia, his theoretical work continued, especially in relation to the question of the geographical distribution of animals and plants. It is from that part of his work that material has been selected for discussion in this section of the paper.

The third period extends from the publication of the Origin in 1859 to Darwin's death in 1882. While it was in many ways a time of defensive manoeuvring as Darwin struggled to respond to growing criticism about the efficacy of natural selection as the major engine of evolutionary change, it was also the period when he produced his works on human evolution. It is this anthropological material that is covered here, chiefly because it offers the most striking example of the complexities involved in unravelling the interaction between the theorist and the knowledge claims he is making.

This periodised approach, although rather arbitrary, nevertheless has the merit of allowing some sort of order to emerge from what might otherwise have been chaos. The material chosen has of

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course been selected to illustrate key points; it is not intended as an exhaustive survey.

THE CRUCIBLE PERIOD
(a) Darwin in Australia

Darwin's visit to Australia in 1836, short as it was (it took up just two months of a voyage spanning almost five years) has been the subject of several books and articles, usually popular expositions based on Darwin's *Journal of Researches*, originally published in 1839 and in many editions thereafter. Some of the more recent publications have made use of the unpublished material available at Cambridge and Down House, especially the field notebooks, letters and the diary upon which the *Journal* was based.5 Much of the secondary literature has emphasised the fact that while in Australia, Darwin's chief scientific interests were in geology.6 While there is some discussion of the standard interests of early antipodean visitors in the *Journal* - the kangaroo, platypus and human inhabitants all received a mention - there is little evidence that he undertook systematic investigations of any kind into the zoology, botany or anthropology of the continent. Even the famous passage in the *Journal* alluding to the possibility that two Creators had been at work in bringing into being similar but separate life forms in Australia and elsewhere, may be no more than the musings of an astute traveller and observer. Claims that the passage represents an early awakening of evolutionary thoughts in Darwin's mind have been made from time to time but the meticulous researches of Frank Sulloway and Jonathon Hodge into the earliest origins of his thinking about such issues suggests that these claims ought to be treated with some scepticism.7 Darwin's reports of his observations of the Australian

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Aborigines are likewise unremarkable and appear to have played no significant role in his later investigations into the origin and development of the human species, although they doubtless reinforced his acceptance of a type of socio-cultural evolution which formed the backdrop to his ideas on human evolution (see Chapter 6 for a full discussion).

Overall, Darwin's Australian visit is somewhat disappointing to the historian of science seeking evidence that the continent influenced in some crucial way the development of his evolutionary ideas. Yet the probable reasons for this are not difficult to find; such a long voyage understandably sapped both energy and enthusiasm, and the overwhelming homesickness of the entire ship's complement is evidenced throughout Darwin's diary and letters. The enthusiasm engendered through reading Humboldt's writings years before had waned long before the end of the voyage.

(b) Back in England - The Transmutation Notebooks
While Darwin's personal contact with Australia may provide lean pickings for historians, his later recognition of the continent's uniqueness as a biological zone and consequently its importance for his theoretical ideas is manifested in a number of ways. Once back in England he was faced with the problem of preparing for publication an account of the zoological collections made on the voyage. Richard Owen, who undertook to work up the fossil mammal material, and John Gould, who was hired to do the same for the ornithological collections, spurred him to look in greater depth at Australian zoology. After his conversion to transmutation in early 1837, that interest grew steadily and through a number of channels he began soliciting material bearing on major questions surrounding the evolutionary hypotheses he developed after that time.9

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8 Darwin's homesickness is best exemplified in two letters written early in 1836 from Hobart, one to his sister Catherine and the other to his cousin W. D. Fox, reprinted in Frederick Burkhardt and Sydney Smith, Editors, *The Correspondence of Charles Darwin* volume 1, (Cambridge: Cambridge University Press, 1987), 487-93.

For this early period the greatest interest lies in the Transmutation Notebooks. These were a series of small notebooks Darwin began in 1837 and ceased keeping in 1844, the year that he composed the first full length essay outlining his theory of transmutation. Among those individuals with an Australian connection mentioned were the explorers Charles Sturt, Thomas Mitchell and John Lort Stokes, along with the naturalists John Gould and George Bennett. Stokes and Bennett were each mentioned only once, in relation to minor issues. Stokes had been with Darwin on the Beagle, and later explored and charted large tracts of the coast of Australia. In the late 1840s, he was involved in an acrimonious dispute with another prominent Australian explorer, George Grey, over the suitability of certain parts of Western Australia for European settlement. Darwin was inadvertently caught up in this dispute when a letter he sent to Stokes containing criticisms of Grey's behaviour, fell into the latter's hands. It took a typically diplomatic Darwin letter to Grey to repair the damage.10 Years later Darwin used Grey's observations of the Aborigines when arguing in favour of the role of natural selection in human evolution.11

Sturt too received only one mention in the notebooks but in a rather more interesting context. As is well known, he undertook two expeditions into the interior of southern Australia between 1828 and 1831 in search of the much rumoured inland sea and, during the first of these, encountered appalling drought conditions which he graphically described in his published account.12 That description caused Darwin to ponder, in one Notebook entry, the effects of drought on the flora and fauna of any given region; he was later to use the concept of drought in the Origin when detailing the subtleties involved in understanding the term 'struggle for existence'.13

Probably the most significant Australian contributions to Darwin's thinking at this period came from another explorer, Thomas


11 See Chapter 6 for a full discussion.


Livingstone Mitchell, Surveyor General of New South Wales. Mitchell carried out an extensive examination of the famed Wellington Caves in the early 1830s. Situated about 150 kilometres south-west of Sydney these caves contained fossils which could be interpreted as suggesting that recently extinct marsupials were closely allied to those still living in the continent. Kathleen Dugan has dealt in some detail with the debate that ensued in Britain when a number of prominent naturalists took up the task of interpreting the Wellington Caves material in line with their own particular theoretical interests and preconceptions.14 Darwin had been made aware of the 'law of succession of types' in South America during the Beagle voyage and the same set of phenomena had earlier been discussed by Charles Lyell and William Clift. In his Principles of Geology Lyell took the Caves fossils as proving 'that the peculiar type of organisation which now characterises the marsupial tribes has prevailed from a remote period in Australia and that in that continent as in Europe, North and South America and India, many species of mammalia have become extinct'.15

For Darwin, who met Mitchell in London in 1838, the importance of the Cave finds stemmed from his belief that they supported the idea of continuous evolutionary change as opposed to sudden extinction followed by new creations. When given an evolutionary twist, the 'law of succession' became a major feature of Darwin's mature theory, and in this regard his use of Mitchell's information at this early stage is of some interest. In the Origin, published twenty years later, Darwin mentioned the Wellington Caves material only once, in a more general discussion of the law of succession which included data from South America, New Zealand and Africa. Given that the Origin was designed to be merely an abstract of his then foreshadowed but never completed 'big species book', it is not surprising that important resources


15 Charles Lyell, Principles of Geology, 3 volumes, (London: John Murray, 1830), volume 3, 143 - 44.
such as the Caves material represented were often distilled to their essence.

References to the Caves are scattered randomly throughout the Notebooks. As issues arose Darwin simply recorded the relevant details, and although it is often possible to reconstruct the development of chains of argument across the Notebooks, it is equally often the case that observations once made were not alluded to again. Mitchell was given as his authority for the claim that only one species of marsupial cat, *Dasyurus*, existed on the mainland of Australia while there were several species in Tasmania. Darwin noted that the fossil forms of *Dasyurus* found in the Wellington Caves suggested a former connection between Australia and Tasmania. Separation had allowed the several species to survive in Tasmania while their mainland relatives, presumably subject to greater competitive struggle, had been reduced to one species.16 Pursuing this point later he speculated on the possibility that the Cave fossils were intermediate between 'those of Van Diemen's Land [Tasmania] and Australia proper. Just as geology suggested that the two separated land masses had once been part of a larger geological area, palaeontology suggested a similar connection between living and extinct animal forms.17

Theoretical problems associated with the extinction of species were at the forefront of Darwin's thinking during the period when the Notebooks were being written. Clearly, any explanation of the origin and diversity of animal and plant species had to be able to account for lost forms. In Notebook B Darwin tentatively suggested that evidence from Australia and South America pointed to 'some mundine [sic] cause as having destroyed animals over the whole world... for instance, reduction of temperature from geographical or central heat'.18 Soon after arriving at his theory of natural selection he was more confident that major extinctions could be attributed to naturalistic causes although specific causes were still beyond knowing. In typically cryptic shorthand Darwin wrote,'The destruction of the great mammals over the whole world shows

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16 Paul Barret *et al.*, op. cit, note 3, 278. The reference is in Notebook C which the editors date as having been written between mid-March and mid-June 1838.

17 Ibid. 319, Notebook C.

18 Ibid. 203, Notebook B, dated by the editors between July 1837 and January 1838.
there is rule - S. America and Australia appear to have suffered most with respect to extinction of larger forms’ and followed this directly with the comment ‘From observing the way the marsupials of Australia have branched into others one is strongly tempted to believe one or two were landed ... and continent since grown.’19

The juxtaposition of these two apparently unrelated comments shows the extent to which Darwin's speculations were guided by what can only be termed the association of ideas and his capacity and willingness to shuffle his information. The entries suggest that from one idea Darwin could move to another that had only a tangential relationship to it. This is not in the strict sense an orderly 'Baconian' accumulation of facts; rather, it seems more reminiscent of the random turning over of the pieces of a jigsaw puzzle. However, though the pieces may not appear to be related to each other directly, when put together according to a given theoretical perspective, each piece helps to make up the completed picture. The Notebooks are full of such instances, which make the reader's job extremely difficult, appearing to demand that one re-create the thought processes of the writer. The two quotations listed above are related, both by the references to Australia and South America, and by the broader issue of geographical distribution. The fossil forms evident in the Wellington Caves became extinct according to 'rule' (by which Darwin here seems to be suggesting scientific law), but when viewed alongside living (marsupial) forms, they suggested to Darwin that Australia had originally been populated by a few forms which under the protection of continental isolation had radiated out into their present diversity. As isolation was a central feature of Darwin's evolutionary structure at the time the point was of some significance.

Mention has already been made of Mitchell's role in encouraging these ruminations. While the law of succession may have been the major theoretical idea elaborated, at least in part, from the Wellington Caves material, a series of related sub-hypotheses also emerged, pertaining to the causes of extinction, the origins of particular faunas and floras and the relationship of closely aligned geographical regions. Here too, Mitchell was often a valuable source of information. An illustration of this was Darwin's curiosity about the Australian native dog, the dingo. From Mitchell he learned that the dingo was not found in

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19 Ibid. 357, Notebook D, dated by the editors between July and October, 1838.
Tasmania, which suggested it had arrived in mainland Australia after the separation of the island.\textsuperscript{20} When in Australia Darwin had been told that the dingo readily copulated with domesticated dogs, even coming to the houses of settlers for the purpose.\textsuperscript{21} Mitchell thought that the offspring of such matings were about halfway between the two in resemblance, even to the tone of the bark. Darwin combined this observation and the earlier one about the dingo's recent arrival to conclude that the dingo had undergone substantial modification of form and habit without losing its ability to breed with other dog species.\textsuperscript{22} It had also apparently lost (or never developed) the ability to hunt in packs, a skill displayed by its South American relatives.\textsuperscript{23} Thirty years later Darwin included many anecdotal references to the dingo in his massive two volume survey of plant and animal breeding, \textit{The Variation of Animals and Plants Under Domestication}, but these particular Notebook entries were not published in his lifetime.\textsuperscript{24}

Australia proved to be crucial in relation to another issue raised by Darwin's speculations at this time, namely the occurrence of superficially similar but apparently unrelated faunas in distinct geographical zones. In Australia the marsupials often displayed the forms and habits of placental mammals elsewhere, but according to Darwin's evolutionary views any relationship between them must have been so ancient as to have no direct effect on their acquisition of such similarities. The kangaroo for example occupied the same place in the natural order as the placental herbivores found in other regions. Rejecting the commonly held view that the Australian fauna represented a surviving, primitive vestige of an earlier geological period, Darwin wrote in Notebook D that 'The Marsupial structures shows that they

\textsuperscript{20} Ibid. 278, Notebook C.

\textsuperscript{21} Ibid. 478, Notebook ZEd (Zoology Notes, Edinburgh Notebook), dated by the editors between March 1827, when Darwin was still at Edinburgh as a student, and sometime after his return from the Beagle voyage.

\textsuperscript{22} Ibid. 288, Notebook C.

\textsuperscript{23} Ibid. 306, Notebook C.

\textsuperscript{24} Interestingly, Darwin relied on evidence from breeders and keepers at the zoological gardens in his published accounts of dingo habits and behaviour. See \textit{The Variation of Animals and Plants Under Domestication}, 2 volumes, (London: John Murray, 1868), volume 1, 5-31, 263, 310-11, volume 2, 215.
became mammalia, through a different series of changes from the placentals, like true Mammalia no more wonderful than Echidna & Hedgehog having spines.' Later he allowed himself to speculate on how this might be explained. "The Echidna & Hedgehog Tenrec both having spines is the effect, partly [of] the same external conditions, and partly laws of organisation [i.e. those laws which prevent infinite variation in every possible way]"

In other words, the necessities of nature, represented by variation, environmental limitations and biological conservatism, dictated within a relatively narrow range the form and structure of organisms inhabiting similar but separate environments. In Mitchell's published journals of exploration, Darwin came across another example of the phenomenon, one which coincidentally solved a problem he had been grappling with earlier. According to Mitchell, the Australian crow was an exceptional scavenger, boldly entering the explorer's camp to find scraps. Darwin had been puzzled by the lack of true carrion birds, especially vultures, in the continent, and Mitchell's observation appeared to offer a possible solution. The crows in Australia had apparently moved into the ecological niche or 'place' as Darwin called it, occupied elsewhere by the vultures.

Mitchell's contributions to Darwin's developing ideas on transmutation are, it must be said, slight and to a large extent anecdotal; but then that was the status of most of the material covered in the Notebooks. It was the overall impact of the accumulated evidence culled from the widest possible range of sources around the globe, however anecdotal, and the stimulus it gave to further investigation that provided Darwin with the foundation for his mature theoretical thinking. In the Latourian sense, he was sorting his material so as to understand the world, shuffling and reshuffling his resources to construct a theoretical picture of biological change over space and time.

25 Paul Barret et al., op. cit, note 3, 373, Notebook D.

26 Ibid. 460, 'Torn Apart Notebook', dated by the editors between July 1839 and May 1840.

A more significant figure to Darwin at this time, and one who had close Australian connections, was the naturalist John Gould. Frank Sulloway has dealt in detail with the relationship between Darwin and Gould in two important papers published in 1982. It was Gould who identified and reclassified the ornithological specimens collected on the Beagle voyage and, according to Sulloway, it was he as much as anyone who sparked Darwin's interest in finding a workable transmutation hypothesis. With his wife Elizabeth, Gould set out for Australia early in 1838 leaving unfinished the task of describing Darwin's Beagle collection for the massive Zoology of the Beagle. In the light of Sulloway's work, such references to Gould as there are in the Notebooks relating to Australia are fewer than one might have expected, and the allusions to him in the first edition of the Origin are apparently unrelated to the Notebooks references. There is nevertheless evidence that Gould provided Darwin with the stimulus at the 'crucible stage' to explore problems relating to species identification and classification, geographical distribution and in one instance at least, hybridity and crossing.

Gould had a reputation as a 'splitter' when dealing with species classification and he seized on often minute differences between specimens in judging whether or not a new species could be identified. The botanist Robert Brown had warned against Gould's tendency to 'split' and it may have been uneasiness on this score that led Darwin to play down Gould's influence in his published work. A sign that he had taken Brown's warning seriously comes from the fact that on one occasion he warned Charles Lyell against accepting a claim by Gould that the British wagtail was a different species from the French. Later Darwin had to caution himself against accepting too readily another of Gould's claims, that there were 'close but certainly distinct species between Australia and Van Diemen's Land and Australia and New Zealand. The case

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29 Charles Darwin, op. cit, note 13, References to Gould are on pages 131-32, 398 and 405.

30 Paul Barrett et al., op. cit, note 3, 314, Notebook C.

31 Ibid. 182, Notebook B, and 314, Notebook C.
supported Darwin's belief that speciation was to a large degree dependent on geographical isolation, but the possibility that Gould might have overstated his case caused Darwin to draw back.

On issues other than those involving species definition Darwin was prepared to be more trustful of Gould. Seeking evidence for the gradation of forms and 'serial speciation' he took up Gould's observation that some groups of Australian birds offered a striking instance 'leading on one side into shrikes and at the other into crows, yet all forming, according to Gould, good species'.\(^3\) Further, Gould told him that where there was a marked colouring of plumage in the species of a given genus, such as black and white banding, with one species exhibiting large bands and another species in the same genus, small bands, there was almost certainly an intermediate form somewhere in existence.\(^3\) This was highly significant for Darwin as it further supported his belief that species that have split from a common stock might nevertheless co-exist in the same geographic area. While Gould's claim never found its way into the Origin it appears to be one of the earliest instances in the Notebooks in which Darwin was forced to consider the possibility that geographical isolation and extinction of prior forms were not absolutely essential for speciation to occur. One must be wary of seeing later publication as the only yardstick for assessing the importance of ideas Darwin was developing in the Notebooks. That would be a misunderstanding of the nature of Darwin's endeavours at this period. The Notebooks are evidence of a cognitive process of questioning, probing, and data accumulation but what they tell us about Darwin's thought processes at the deepest level is always going to be open to question. As Martin Rudwick has stressed, such cognitive processes are at work behind all levels of an individual theorist's activity.\(^4\) For that reason alone, the best that can be said about Darwin's use of Australian material in his early theorising about the transmutation of species is that it was part of a much larger body of observation, fact, anecdote, and

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\(^3\) Ibid. 264, Notebook B.

\(^4\) Ibid. 273, Notebook B.

interpretation, which taken together, constituted the bed-rock upon which much of his later theoretical structure was built.

Of course, selectively extracting material as I have done here carries certain dangers; of necessity it removes that material from the contexts of the Notebooks as a whole in a way which could be seen as distorting the importance of Australian resources in the development of Darwin's ideas. Australian material was more than just 'material stuff', being an important part of Darwin's extraordinary accumulation, utilisation and transformation of resources from around the globe and helping to shape his successful attempt to build a 'centre of calculation' at Down House.

AFTER THE ESSAY - DARWIN AND HOOKER

Dov Ospovat has argued that after writing his Long Essay in 1844 Darwin concerned himself with a series of problems which by 1856 had changed the framework of his theory of evolution. According to Ospovat, from an initial acceptance of Charles Lyell's view that species were perfectly adapted to their environment, Darwin moved to embrace a form of 'relative adaptation'. Ospovat's claim has recently been challenged by David Kohn who believes that Darwin abandoned (if in fact he ever held), 'perfect adaptation' much earlier. However that may be, information gathered from numerous sources caused him to abandon the idea that species were individually designed for their particular habitats. Environments change over time, and geology and palaeontology showed that populations inhabiting those environments did likewise, though often containing forms which appeared to be related to their predecessors' generic group. This much Darwin had been aware of from the fossils collected in South America and the Wellington Caves, though the significance was not perhaps always clear.

While Darwin was engaged on these and other problems his main source of information was the botanist Joseph Dalton Hooker who had spent two periods in Australia between 1839 and 1842 while serving with the Ross Antarctic expedition. After his return to Britain in 1843 Hooker retained close links with the Australian colonies through an extensive network of colonial correspondents in contact with Kew where

his father was Director and where he himself was employed as a botanist. Kew became a classic centre of calculation, pulling in vast quantities of plant material from around the globe and dictating to an extraordinary extent the style and research of botanical investigation worldwide. From the mid-1850s on, Darwin was able to make use of this network.  

The two men began their long friendship soon after Hooker's return to Britain. Nearly 400 known items of correspondence between them still exist and Hooker was a frequent visitor to Down House, Darwin's home in Kent. There, as Hooker later recalled, Darwin 'pumped' him for information, producing heaps of paper slips 'with questions botanical, geographical etc.' for Hooker to answer. A surprising number of these questions dealt directly with Australian matters, usually involving issues of adaptation and the distribution of the continent's flora. It was to Hooker that Darwin first confessed his belief in transmutation in 1844. Over the years, Hooker's initial distrust of Darwin's speculations gave way to acceptance, culminating in 1859 when his Introductory Essay to the Flora of Tasmania was published. This was the first attempt to interpret a particular native flora in Darwinian terms and not surprisingly, Darwin was quick to express his pleasure. In broad terms, there is a sense in which Hooker's acceptance of transmutation ensured that the centre Darwin was constructing at Down now exerted a strong theoretical pull over that of Kew, an interesting subplot to the Latourian story.  

The correspondence between Darwin and Hooker provides an accessible and historically interesting area of analysis, for the letters illustrate the manner in which scientific knowledge may be constructed. Darwin's delight in bouncing ideas off his friends and family is legendary, and in Hooker he had a patient and willing collaborator. What


37 Frustratingly, the spelling of Darwin's home as 'Down' differs from that of the village, 'Downe'. To avoid confusion I shall use the former, intending the reference to be to Darwin's home, unless otherwise stated.  


39 Leonard Huxley, op. cit, note 36, volume 2, 413.
follows here can only give the slightest sense of the intensity of this collaborative effort. So far as possible the material selected has been chosen to illustrate the manner in which the collaboration played a role in developing Darwin's ideas. Australian material formed so large a part of this collaboration that it involves no distortion to concentrate on it.

In 1854 Hooker wrote setting out his conclusions about the distribution of plants in Australia. In a list of some 900 species of Leguminosae he found only 10 that were common to both South West and South East Australia. How was this to be explained? There was no doubting that the species belonged to the same family, but in this one continent the extent of variation and divergence had been extraordinary. The case fascinated him; he described the flora of South West Australia as 'the most peculiar on the globe', specifically quite distinct from that of New South Wales.

Darwin accepted Hooker's finding with some satisfaction, having earlier reviewed George Waterhouse's *Natural History of the Mammalia*, and noted there that what Hooker had since discovered about the flora was true of the mammals, namely, that distinct species inhabited South West and South East Australia. When John Gould told him that the same held good for birds in the continent, he felt confident enough to propose an explanation for the phenomenon. Suppose Australia had once consisted of two islands separated by a shallow sea? Isolation could then be invoked to explain the development of different species. While isolation did not induce variation directly it did allow divergence to occur by separating breeding populations. In the *Origin*, Darwin used the case when discussing the problems of geographical distribution and his proposed solutions to them.

Some of Hooker's information on plant distribution and wider relationships proved to be less tractable. The Tasmanian flora was a case in point. According to Hooker, the island's plant species exhibited features that made them either very distinct from those of continental

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40 Ibid. volume 1, 446-47, Hooker to Darwin, N.D

41 Ibid. volume 1, 447, Hooker to Darwin, March 2,1855.

Australia or identical to them; there was no gradation between them, there being very few species exhibiting minor variation from mainland forms.\textsuperscript{43} Isolation could account for either of these phenomena alone but it was difficult to see how it could encompass both. Similarly, Darwin had to admit to being perplexed by Hooker's claim that the flora of South West Australia bore a 'feeble' but real affinity to that of the Cape of Good Hope.\textsuperscript{44}

As Darwin wrestled with the numerous issues raised by the Australian flora he took up Hooker's suggestion that he ask the advice of experts on the spot. Using the Kew network, in 1858 he wrote to Ferdinand Mueller, Director of the Melbourne Botanical Gardens seeking information about the spread of European plants in the continent. Mueller (in a letter now lost) told him that some European perennials were 'advancing in sure progress', a progress 'not to be arrested'.\textsuperscript{45} Charles Moore, Mueller's counterpart in Sydney responded to a similar request from Darwin with a list of the British perennials known to set seeds in New South Wales and Queensland. Amongst these were a number of weeds which had proliferated in the Bathurst and Goulburn districts. Moore assured Darwin that species such as the gooseberry and black-currant did poorly around Sydney but thrived in the Bathurst and Goulburn districts. Further north in Brisbane however, few British plants seeded freely, a fact Darwin noted as showing that temperature could be as effective a barrier as physical impediments to migration in distinguishing species boundaries.\textsuperscript{46}

It was this issue that raised a tricky philosophical problem. Sometime in 1858, Darwin had told Hooker that he believed Australian

\textsuperscript{43} Hooker to Darwin, March 1855 in Leonard Huxley, \textit{op. cit}, note 39, volume 2, 448-49.

\textsuperscript{44} Darwin to Hooker, November, 1858, Darwin \& Seward, \textit{op. cit}, note 42, volume 1, 447-48.

\textsuperscript{45} Darwin wrote to Mueller on 6th December, 1858, seeking this information, but this must have been a reminder as he quotes from Mueller's reply in a letter to Hooker dated 28th January 1859. The letter to Mueller is listed in Frederick Burkhardt \& Sydney Smith, Editors, \textit{A Calendar of the Correspondence of Charles Darwin, 1821 - 1882}, (New York:Garland Publishing, Inc., 1985), 116. Darwin's letter to Hooker is in Darwin \& Seward, \textit{op. cit}, note 42, volume 1, 451-52.

forms were 'lower' than Old World ones. Years earlier he had given a definition of what these terms meant for him, one which depended on 'morphological differentiation' from the common embryo or archetype of the class. The more differentiated and the greater number of specialised organs present, the higher Darwin believed the organism to be.47 Hooker had apparently agreed with this definition, but on receiving Darwin's letter regarding the 'lowness' of the Australian flora he declared himself to be 'horrified'. 'Under every method of determining high and low in Botany the Australian vegetation is the highest in the world', he declared, going on to list six areas where his claim could be supported. All drew on the sort of differentiation Darwin had previously used as part of his criterion for defining highness and lowness but which he was now apparently questioning.48

Darwin's response to Hooker was to propose a different definition of the terms 'higher' and 'lower'. No longer was it morphological distinctions that provided the scale. Instead 'competitive highness' became the yardstick. With the findings of Moore and Mueller presumably in mind, he pointed out that the success of European plants in colonising Australia lent support to his new view. This explanation drew directly on his own theories of struggle, variation and selection. Species from a very large and generally uniform geographical area such as Eurasia were presumably subjected to greater competition than those inhabiting isolated areas such as Australia, with the result that natural selection brought them to a higher stage of development. This interpretation explained a phenomenon Hooker himself had drawn attention to, namely the fact that plants tended to migrate from the northern to the southern hemisphere rather than the reverse.49 Nevertheless, Hooker remained dubious, arguing that 'some Australian plants were running wild in India'. He went further, trying to turn Darwin's argument to his own advantage. Suppose that the Australian flora were 'a remnant of an ancient and more extensive one which had once covered a much greater area in the southern hemisphere, then

47 Darwin to Hooker, 1854, Darwin & Seward, op. cit, note 42, volume 1, 76.
48 Hooker to Darwin, 26th December 1858, Huxley, op. cit, note 36, volume 1, 463.
49 Darwin to Hooker, 30th December, 1858, Darwin & Seward, op. cit, note 42, volume 1, 114-17.
Darwin's claim for the superiority of the European flora could be applied to it. In that case, 'Granting with Darwin that the principle of selection tends to extermination of low forms and of multiplication of high, it is easy to account for the general high development and peculiarity of Australasian plants..."50 Darwin was by now sure of his position and remained unconvinced; but in what was presumably a concession to Hooker he shifted his ground slightly in the Origin, referring to the European plant colonisers as 'dominant forms' rather than as higher ones.51

Hooker's most significant contribution to the early debates on the Darwinian theory appeared in the Introductory Essay to the Flora of Tasmania, in the preface to this, the last section of his work on the Antarctic flora. Whereas in the earlier sections he had proceeded on the assumption that species represented stable entities, he now couched his discussion in terms of the likelihood that random mutation was the norm. He took the view that the lines demarcating genera, species and varieties were arbitrary ones; variation was the most likely means by which nature had peopled the earth. Variability being the norm in nature, Hooker followed Darwin in believing that varieties, when varying further, tend to depart more and more from the original type. Once a plant species has become 'unstable' (i.e. begins varying) then the only check on it comes from cross-fertilisation; there are therefore two opposing tendencies at work, with variation within a group remaining stable through crossing. Selection eliminates 'unprofitable' varieties, the result being the appearance of fixity of species, an appearance brought about by 'gaps' resulting from extinction of the intermediate varieties. It was only those gaps which according to Hooker allowed the botanist to classify plants into genera, species and varieties at all.52

Hooker saw the Australian case as a particularly good one for testing Darwin's theory 'on account of the comparative uniformity of its physical features being accompanied with a great variety in its flora; because of the difference in the vegetation of its several parts; and because

50 Hooker to Darwin, 26th December, 1858, Leonard Huxley, op. cit, note 36, volume 1, 463.

51 Charles Darwin, op. cit, note 13, 379.

52 Joseph Hooker Introductory Essay to the Flora of Tasmania, (London: Reeve Brothers, 1859), passim.
of the peculiarity both of its fauna and flora as compared with those of other countries'.53 One can see here the culmination of discussions with Darwin, covering some 14 years. Hooker mentioned the fact that by and large the Tasmanian flora approximated that of Victoria, from which it had become separated 'aeons ago'. Why had natural selection not modified the flora in each area to the same extent as it apparently had that of South Western and South Eastern Australia? The simplest answer to this was to be found in the greater distances separating the latter areas compared with that separating Victoria and Tasmania. It was at least possible to postulate a constant supply of plant seeds across Bass Strait carried there by winds, currents and migrating birds. This would help to maintain the relative uniformity of the two floras, but Hooker's discussion with Darwin on the peculiarities of the two mainland areas showed there was no such mechanism at work in that case. The combination of variation and isolation had led to the formation of two quite distinct floras.54

One can summarise Hooker's acceptance of the Darwinian theory as it was reflected in his work on the Tasmanian flora by using the five points set down by his biographer W.B. Turrill. Hooker assumed genealogical continuity since the earliest known geological period; the rise of differences through individual variation; their definition through the extinction of intermediates; their stability due to cross-fertilisation, and finally, accepting Darwin's notion of 'relative adaptation', he took the view that only those that were better adapted to their temporary physical conditions would survive and germinate.55

Addressing the Geographic Section of the BAAS more than twenty years later, Hooker pointed to 'all the leading facts of distribution' that were explained by the Darwinian theory including 'the multiplication of new forms; the importance of barriers in forming and separating zoological and botanical provinces; the concentration of related species...'56 In these and other areas, Australian material, often mediated through Hooker's experience, played a significant role in the

53 Ibid. Preface, iii.
54 Ibid. Preface, iv.
55 W.B. Turrill, op. cit, note 36, Chapter 5, 'Hooker and Darwinism'.
56 Ibid. 97.
working out of Darwin's ideas. In turn, having been accumulated, shuffled and re-interpreted at Down, this material was fed back into the Kew network where it instituted a radical new research programme for understanding flora's around the globe.

AFTER THE ORIGIN: THE WORK ON MAN

Very quickly after the publication of the *Origin* Darwin became something of a celebrity both at home and abroad. The book was on sale in Australia four months after its first appearance in England and over the course of the next two decades colonial scientists (and others) took their stand for and against the author. Ferdinand Mueller and Charles Moore rejected the theory outright. Mueller effectively ceased to answer Darwin's requests for information after 1860, writing only once more, in 1874, seeking Darwin's 'great influence', when his own position was threatened. (Although see below for complication of this claim.) 

Others were less disturbed. Darwin's former shipmate on the *Beagle*, the artist Conrad Martens wrote a friendly letter in 1862 admitting that he found the ideas in the book unsettling but not enough to cause him to break off a friendship. The geologist and parson William Branwhite Clarke sent several letters containing geological information, and seems to have maintained a position on the Darwinian theory not unlike that of John Henslow, Darwin's Cambridge mentor, neither fully approving nor disapproving of the new ideas. Darwin himself actively continued seeking information. In 1874 he wrote to Caroline Denison, widow of William Denison, the former Governor of both Tasmania and New South Wales, enquiring about the fertility of the Pitcairn Islanders after their forced removal to Norfolk Island. William Denison had attacked the


58 Mueller to Darwin, 16th June 1874. DAR 171, Cambridge University Manuscript Room.

59 Martens to Darwin, 20 January, 1862. DAR 171, Cambridge University Manuscript Room.

60 Burkardt & Smith, op. cit, 45. There are six letters listed between Darwin and Clarke. Clarke's attitude to Darwin is discussed in Elena Grainger, *The Remarkable Reverend Clarkes*. (Melbourne: Oxford University Press, 1982), Chapter 21 'Mr Darwin's Book'.
Darwinian theory on at least two occasions, but nonetheless Caroline sent a courteous reply, although unable to supply the information sought.61

With the passing of time, Darwin's fame became such that interested parties sent material to Down unsolicited. The following chapter deals in some detail with the important contributions of James Drummond, Gerard Krefft, Alfred Howitt and Robert David Fitzgerald in the years after 1860.62 Letters between Darwin and his former shipmate and servant Syms Covington, who settled at Pambula in New South Wales, have been published at least twice.63 There were other, less well known correspondents. In 1873 one of these sent Darwin an account of a particularly vicious Australian caterpillar which caused pain and inflammation when touched. Always the epitome of courtesy, Darwin acknowledged the letter but pointed out that he already knew of the case.64 Books too, often arrived from admirers around the world. Robert Brough Smyth, one of Victoria's most notable bureaucrats, sent volumes of the Journal of the Geological Survey of Victoria, and was also instrumental in supplying Darwin with vital source material of a different kind (see below).65 A year before his death Darwin received from the Australian pastoralist James Dawson a copy of his important book Australian Aborigines. Dawson was a sympathetic observer of the Victorian native tribes, and with the help of his daughter had gathered together in this volume some useful if somewhat anecdotal material on the fast disappearing Aboriginal societies. It was too late for Darwin to use, of


64 Darwin to Leffer, 7th May 1873, La Trobe Library, Melbourne.

65 Darwin to Brough Smyth, 23rd October, 1876, La Trobe Library, Melbourne, MS 8781.
course, as was Dawson's dubious story of the discovery of a mutant marsupial rabbit in Australia.66

It was for his investigations into the evolutionary history and development of man that Darwin sought most keenly for Australian evidence in the last phase of his career. He was fortunate to have as a neighbour in Kent Edward Wilson, the former proprietor of the Melbourne Argus. Wilson had returned to England in 1864, settling close enough to Down to become an acquaintance of the Darwin family and a regular visitor to the house. Wilson's role in a major controversy over evolutionary theory in Australia is discussed in Chapter 4. According to Darwin it was Wilson's 'powerful influence' that led to his receiving some of the 13 sets of replies from Australia to his 'Queries on Expression'.67

In 1867 Darwin had circulated these queries to missionaries, civil servants and military personnel around the world, and by collating the responses he felt able to provide substantiation for many of the claims made in his second work with considerable anthropological interest, The Expression of the Emotions in Man and Animals published in 1872.68 It appears that Wilson used his influence to encourage Brough Smyth to have the questionnaire circulated among missionaries and civil servants having personal contact with the natives. These responses constitute the largest single Australian contribution to any of Darwin's published works, although as the following analysis shows, he was highly selective in what was actually included in the Expression of the Emotions.

Six of the original responses from Australia still survive. Of these one came from a pastoralist, Templeton Bunnett, one from a school teacher, Archibald Lang, one from a police magistrate, H. B. Lane and two from missionaries, John Bulmer and Frederick Hagenhaur. Dyson Lacy, a relative of Brough Smyth's living in Rockhampton, Queensland, also responded. Among others to do so and who were mentioned in Darwin's book, but for whom there are no surviving manuscripts are the

66 Dawson to Darwin, 30th July 1881, DAR 162, Cambridge University Manuscript Room.


Reverend George Taplin from the native Industrial Settlement at Port Macleay, South Australia and Samuel Wilson, a landowner from Victoria. Brough Smyth himself sent a number of observations which while not directly related to any of Darwin's queries were utilised in Expression of the Emotions. Brough Smyth also forwarded a set of responses from Ferdinand Mueller, who may have been a link in the chain connecting some of the respondents to Darwin.

The questionnaire itself contained 17 queries, all in some way designed to uncover whether certain expressive reactions were universals of human behaviour. The psychologist Paul Ekman, despite being an admirer of Darwin's book, has nonetheless drawn attention to the inadequacies of the questionnaire as a means of obtaining objective data. All 17 queries were narrowly focussed, demanding unequivocal positive or negative responses. Query No. 1 for example asks 'Is astonishment expressed by the eyes and mouth being opened wide and the eyebrows being raised?' There is no allowance here for observer interpretation in framing a response, which could be seen as an advantage, but the question is so narrowly and tightly conceived as to make anything but a yes or no response all but impossible. Collating the results obtained from this sort of procedure could (and did) lead to a selective bias on the part of the collator.

The Expression of the Emotions was a key volume in the canon of Darwin's evolutionary publications. In The Descent of Man, published a year earlier, Darwin had been concerned mainly with the anatomical, physiological and mental evolution of man. Breaking down the alleged barriers between human and animal behaviour was a logical next step in his programme, as was showing the universality of key facial and bodily expressions of emotion across racial boundaries, and where possible tracing out the rudiments of such expressions in the lower animals. He clearly believed that the observation of non-European races, preferably those untainted by the process of civilisation, could play a crucial role in

69 R.B. Smyth to Darwin, 13th August 1868, DAR 177, Cambridge University Manuscript Room.

70 Darwin sent his questionnaire to Mueller on 27 February, 1867 DAR 92, Cambridge University Manuscript Room.

satisfactorily making out his case. In this regard he thought that the Australian Aborigines would prove to be a valuable resource, yet as the published product of his investigations shows, the programme he set for gathering and interpreting material was highly problematic. Traditional Aboriginal culture in Australia, and especially in Victoria where most of his informants were based, had either been destroyed or was rapidly deteriorating by 1867. Disease, violent confrontation and the encroachment of white settlement had undermined the basis of the native culture, and Darwin's correspondents were invariably dealing with Aborigines living at the interface of native and European societies where this process was often most advanced. 72 As a result, the material provided to Darwin was little more than a collection of often conflicting observations amenable to a variety of shifting interpretations.

As an example, take Query No. 12: 'Is laughter ever carried to such an extreme as to bring tears to the eyes?' Only four of the Victorians responded to this particular query and they were divided equally on the matter; yet in his book Darwin ignored the two negative responses and by quoting at length from one of his Australian correspondents conveyed the impression that there was unanimous affirmation of the proposition:

Mr Bulmer, a missionary in a remote part of Victoria remarks 'that they have a keen sense of the ridiculous, they are excellent mimics, and when one of them is able to imitate the peculiarities of some absent member of the tribe, it is very common to hear all in the camp convulsed with laughter. With Europeans hardly anything excites laughter so easily as mimicry; and it is rather curious to find the same fact with the savages of Australia, who constitute one of the most distinct races in the world.'

When dealing with Query 13 which asked whether the natives shrugged their shoulders as a sign of resignation, Darwin quoted Templeton Bunnell's response in favour of the proposition despite the fact that four other correspondents had answered in the negative. 74 Brough Smyth

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73 Charles Darwin, op. cit, note 67, 207.

74 Ibid. 278. When giving Bunnell's response Darwin says that his informant added that 'the gesture is performed in a more subdued and less demonstrative manner than is the case with civilised nations. This circumstance may account for its not having been noticed by four of my informants'.

himself reported the case of a full-blood aboriginal, Thomas Bungden, who, on being greatly frightened 'showed a complexion as nearly approaching paleness as could be conceived in the case of a very black fellow'. Bungden had been reared and educated in white society, but when Darwin retold the story in his book he omitted this possibly important fact. Another of Brough Smyth's reports (itself second-hand) concerned Jemmy Barber, a full blood aboriginal who, on being taken to the theatre in Melbourne for the first time showed his astonishment at the antics of the acrobats by 'protruding his lips and making a noise with his mouth as if he was blowing out a match'. Again, Darwin repeated the story, claiming that Jemmy was 'from the interior', an embellishment loaded with submerged meanings, but one not present in Brough Smyth's account.\footnote{R.B. Smyth to Darwin, 13th August 1868, op. cit, note 69. Charles Darwin, op. cit, note 67, 285, 294.}

This sort of shuffling and manipulation of data is not unusual in scientific practice. Darwin knew what he wrote, as the explicit and carefully phrased Queries show. And it must be said that he had a great deal more data from around the world available to him than merely these Australian examples so that this 'selection' may not be as severely problematic as first appears. Nonetheless Expression of the Emotions was probably the most methodologically unsound of all Darwin's books, which makes Ekman's point that it remains a pertinent work even today all the more interesting from both a historical and sociological perspective.\footnote{Ekman, op. cit, note 71, ix.}

The book was not without its contemporary critics, however, even in Australia. In a letter to the anti-Darwinian anatomist Richard Owen, Edward Hills, a former kangaroo hunter from New South Wales, disputed Darwin's claim made in The Expression of the Emotions that, when fighting, kangaroos never resorted to biting. Hills pointed out that Darwin's claims were based on observations of kangaroos in captivity, and his own experiences in the bush told him that these could not be extrapolated to animals in the wild state.\footnote{Hills to Owen, Owen Papers, British Museum (Natural History).}

Taken as a whole, Darwin's use of Australian material on man is of considerable interest. In Chapter 6 his use of Australian resources...
in building an evolutionary theory of human history will be discussed and shown to be a good example of the social construction of scientific knowledge, based largely on ideologically pre-packaged resources. In the case of his Questionnaire his sources were closer to the phenomena and were constrained by the narrow focus of the queries - yet the knowledge claims he constructed from them still remained highly problematic.

CONCLUSION

From the time he arrived back in England from the Beagle voyage in 1836 until his death in 1882 Darwin maintained a strong interest in Australia's natural history. The biological peculiarities of the continent were an obvious source of problematical material for a scientist engaged in formulating a concept of species formation; indeed, as Kathleen Dugan has shown, the marsupial and monotreme productions of Australia played a key role in pre-Darwinian theoretical debates.78 While Australia probably gave no particular stimulus to the initial formulation of the theory of natural selection, it may well have strongly shaped the development of it.

It seems curious that in all the comparative studies of the reception of Darwinism little has been said about the two way flow of information that occurs in the process. Historians of colonial science have sometimes uncritically accepted centre-periphery models with all the heavy emphasis on patron-client relationships. While there is no direct attempt to address that situation in this chapter, it ought to be clear that Darwin's Australian sources were of two kinds, a bifurcation that poses problems for such simplistic models. The first kind of source is that exemplified by Mitchell, Gould and pre-eminently, Hooker. Here the resources are mediated through the interests of the centre - theoretical or institutional. The second kind of source is that exemplified by the last section of this chapter. It is here that the highly problematic question of observer participation emerges; Darwin's Australian correspondents, especially those replying to his queries on expression, controlled the amount, form and substance of the information they provided despite the narrow focus within which they were asked to work. They were

themselves subject to a variety of ideological constraints on the ways in which they interpreted their own observations, and Darwin took the total package when accepting Australian knowledge claims and then adapted it for his own purposes. On that basis it is not unreasonable to claim that Australians played a role in constructing the background against which the Darwinian theory was set and developed.

In terms of the Latourian ideas relating to the creation of centres of calculation, what is evident from the material presented here is a complex instance whereby one such centre served as a source of primary material for the creation of another. Through its imperial networks, Kew under the Hookers became a centre of calculation second to none insofar as it controlled the agenda to be followed in systematising and cataloguing floras globally (and turned that knowledge control into power directly in the cases of rubber and jute). At the same time it provided Darwin at Down House with much of the information, or access to it, he needed to create a centre of calculation which in many ways was even more powerful, to the extent that it brought about a revolution in the understanding of life itself, historically and geographically. In the following chapter I want to extend the analysis by looking at the variety of ways in which Australian workers collaborated with Darwin in the years following the publication of the Origin, and further to suggest that there are profound differences between these workers in their roles at the periphery of science.

79 Lucille H. Brockway, op. cit, note 4.
CHAPTER 2

DARWIN'S AUSTRALIAN CORRESPONDENTS: DEERENCE
AND COLLABORATION IN COLONIAL SCIENCE

If Darwin’s use of Australian resources serves to illustrate in some
manner the Latourian thesis that knowledge is constructed and largely
controlled through the creation of centres of calculation, then the
perception of Darwinism from an Australian perspective throws light
on the question of the spread of Western science from the scientific and
cultural centres to the geographic and cultural peripheries. Attempts to
construct theoretical models for understanding that process have
attracted considerable attention from historians. Critics of such models
have focussed their attack on the implicit assumptions that seem to
underlie them. As indicated in the Introduction, George Basalla’s three­
stage model for the spread and development of Western science is the
best known, and if not the first, then certainly the most widely
discussed. It has however been around for nearly twenty five years and
subsequent research has thrown considerable doubt on its usefulness as
an explanatory device.1 Wade Chambers especially has been trenchant
in his criticism of the periodisation approach to understanding the
development of science away from the centre.2 In this chapter I will use
the case of Darwin’s Australian correspondents to attempt an analysis
of scientific development in Australia, based on Darwin’s contacts with
Australians, which counters the dismissive attitudes towards the fine
texture of science at the colonial 'periphery' implicit in models of the
Basalla type. Between the extremes of 'deference' and 'collaboration' in
centre-periphery relationships there exists a field for historical enquiry
which encompasses both local and global questions, but which does so in
a way that recognises the coherence and legitimacy of science at the
periphery.

The argument presented here depends on the recognition
that there is no single set of historical materials or conditions which can

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1 George Basalla, 'The Spread of Western Science', Science, 156, (5 May 1967), 611-22.

be taken as representing the true state of science in Australia at any one time. It follows therefore that analyses based on single areas such as the process of professionalisation in science or its institutional growth will give at best a limited view of scientific development, and at worst, an erroneous one. At any given period, the markers supposedly distinguishing the developing stages of colonial science will often be found to coexist; this applies as much to the attitudes towards theoretical and epistemological issues in colonial science as it does to the structural and social elements.

The reception of Darwin's work in Australia in the years following the publication of the *Origin of Species* in 1859 provides an interesting subject for a historical analysis that takes account of the response to ideas as a component in the mechanism of scientific development. Darwinism, as Robert Young and others have shown, embraces a host of doctrines, attitudes and disputes which lifts it from its somewhat narrow scientific base into a wider realm of cultural history. Darwinism constitutes at once an example of a new understanding of the biological sciences emerging from a series of debates undertaken between 1830 and 1870, and a crucial component of that debate. Put rather simply, the change in perception of what biology was taken to be involved an epistemological shift from a 'creationist' stance to a 'naturalistic' one. Neil Gillespie has defined the creationist position as being predicated on the belief that 'the world and its contents and processes were a direct or indirect result of divine activity'. In the naturalistic approach, scientific knowledge (and specifically in this instance, biological knowledge) was limited to the laws of nature and to processes explicable by reference to secondary or natural causes exclusively. In Australia debate about the scientific validity of Darwinism took place against a background of colonial science that must be understood on several levels, including one that involves this changing view of science.

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EUROCENTRICITY AND AUSTRALIAN SCIENCE

As the material presented in Chapter 1 illustrated, scientific knowledge of Australia in the nineteenth century was constructed in Europe, by Europeans, within a European tradition and with constraints imposed by that tradition. The creation of scientific societies in each of the Australian colonies, the setting up of Government supported Geological surveys and Botanical Gardens, and finally the establishment of the first universities in Sydney and Melbourne, ensured that the British domination of Australian science became entrenched and institutionalised. Colonial culture, derived as it was from an essentially British background, reinforced that eurocentricity still further.

Scientific societies were based on British models, produced journals along the lines of their British counterparts and investigated problems on the agenda of British scientists. Scientific departments were staffed in the main from Britain, by Britons, and on the recommendation of fellow Britons. At Melbourne, for example, Frederick McCoy was given the chair of Natural Science on the recommendation of a London based committee that included John Herschel and George Airy, while George Britton Halford became the first Professor of Medicine on the strength of recommendations from Richard Own and James Paget.

Thus the institutional, and to a large extent the professional, growth of science between 1830 and 1870 in the Australian colonies demonstrated a commitment to a British structure of science and by extension to a British attitude to the whole enterprise of science. But, more importantly, it contributed to the entrenchment of a particular vision of the scientific enterprise, namely, in Gillespie's terms, a creationist vision. In the latter half of the nineteenth century - and specifically though not exclusively, affecting biology - there developed a tension in Australian science as this tradition was challenged by the new orthodoxy being constructed (still in Britain) by Huxley, Tyndall, Clifford and and their disciples and students. It is an irony of Australian history that at a time when, in Gillespie's terms, naturalism was rising to dominance in Britain, an older scientific tradition was becoming institutionalised in Australia. McCoy and Halford in the University of Melbourne, Mueller and Moore at the Melbourne and Sydney Botanical Gardens, along with William Sharpe Macleay and his

influential circle in Sydney, shaped the public image of the biological sciences well into the 1870s, and they shared the creationism of the men at the metropolitan centre who appointed them, or to whom they looked for intellectual approval. It is this type of institutionalised science that provides the norm against which models of scientific development at the periphery are assessed. Yet however much it dominated Australian perceptions, it did not prevent the emergence of a home grown heterodox scientific tradition. This tradition was grounded in a naturalistic approach to the biological sciences, and grew in large part out of the Darwinian view of the natural world, resulting in a research programme distinguishing it from its institutional rival. The type of science being done in Australia in the period from 1860 onward is therefore not easily classifiable into distinctive traditions. Collectors with European benefactors were not uncommon, while professional scientists, like Mueller in Melbourne and Moore in Sydney, inclined to classification rather than theorising. In a general sense one can see the scientific enterprise as a continuum from 'deference' to 'collaboration', and Darwin's Australian correspondents after the publication of the *Origin* are themselves indicative of this continuum. What follows here is a discussion of some of the issues this raises in relation to the kind of model-building mentioned above, using the work and attitudes of four of the more prominent of Darwin's Australian correspondents. The last of these, the botanist and surveyor Robert David Fitzgerald, is dealt with in some detail in order to highlight the manner in which Darwinism as a research programme could be used when the person concerned was unconnected to any institutional base. As a single case study, the story of Fitzgerald adds further substance to Chamber's critique of the periodisation approach to the development of colonial science.

**JAMES DRUMMOND, PLANT COLLECTOR**

Six months after the publication of the *Origin*, Darwin used the Kew network to obtain information from James Drummond in Western Australia. A professional collector for nearly thirty years and a correspondent of William and Joseph Hooker, Drummond provided

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6 The scientific careers of McCoy, Halford and Macleay are discussed in Ann Moyal, *Scientists in Nineteenth Century Australia*, (New South Wales: Cassell Australia, 1976).
collections of Western Australian plants to Kew and supplied commercial outlets in Britain with Australian seeds. His contributions to the development of Darwin's ideas are small but important for historians of Australian science insofar as they throw light on the relationship between colonial collector and metropolitan theoriser.

In January 1861, Darwin reported in the Gardener's Chronicle on his success in cultivating plants of the Australian composite *Pumilio* in the hothouse at Down, using seeds sent by Drummond. *Pumilio* has a number of peculiar contrivances which assist its survival in the arid environment of Western Australia, and Darwin made much of these apparently adaptive structures as offering support for his ideas on natural selection. However, Drummond's greatest contribution to Darwin's work came through his observations on another Australian plant, *Leschenaultia formosa*. Initially, he was unable to find any evidence supporting Darwin's belief that insects played a crucial role in the fertilisation of this group. But, urged on by Darwin, he continued his observations and late in 1860 reported that he had seen small bees extracting pollen from the indusium of *Leschenaultia*. In May, 1861 Darwin contributed a paper to the Journal of Horticulture describing his own and others' experiments with *Leschenaultia*, including those communicated to him by Drummond.

Ten years later, and eight years after Drummond's death, Darwin published a second paper explaining his interest in *Leschenaultia* in the broader context of his evolutionary ideas. Contrary

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7 Drummond's career is covered extensively in Rica Erickson, The Drummonds of Hawthornden, (Perth: Lamb Patterson, 1965).


9 Drummond to Darwin, 17 September, 1860 - this letter is lost, but Darwin refers to it in his reply, 22 November, 1860. Original in the Battye Library, Perth, Acc. 2275A.

10 Drummond to Darwin, 8 October, 1860. DAR 162, Cambridge University Manuscript Room.

to some opinions, he claimed that these plants were not forced by 'inevitable contingency' to undertake self-fertilisation. For Darwin, cross-fertilisation was a crucial component in his explanation of survival strategies among plants and animals - it provided more vigorous offspring, and its re-mixing of the hereditary material increased the likelihood of favourable variations emerging, upon which natural selection could work. By 1876, when he published his ideas on this subject in book form, Darwin had accumulated an impressive body of supportive evidence from botanists around the world and he omitted direct reference to Drummond's work, although his own 1871 paper drawing on the Australian's information received passing mention.

Darwin's relationship with Drummond, albeit short-lived, fits the classical pattern of the metropolitan theorist drawing upon data obtained from the colonial fact-gatherer (although even here the data is not strictly speaking 'raw', being interpreted through Drummond's observations). Drummond himself seems to have been happy with this relationship, for he 'treasured Darwin's letters, placing them carefully with the bundles of letters received from Hooker and others'. His age and background limited the style of his activities, and while there is good evidence that he took a close interest in all aspects of science and encouraged others to do the same, he was apparently content to allow others to use his own work as a building block for the construction of higher level theoretical structures. 14

This division of labour between patron and collector is strongly embedded as the norm in the traditional historiography of Australian science, and while this may reflect the reality of the situation in cases such as Drummond's, it can be legitimately argued that in many instances it serves only to obscure the issues under discussion. It has certainly skewed the interpretation of Australia's scientific traditions, while contributing to a now outmoded historiographical approach to the history of science generally. We have outgrown the


14 Rica Erickson, op.cit, note 7, 154.
crudely formulated 'great man' syndrome, but as James Secord has recently pointed out, we are still prone to view Victorian science from the perspective of hagiographers who have bequeathed to us a daunting array of multi-volume lives and letters of the most prominent figures in the major debates. As a result (and this is surely what lies at the heart of the Basalla model), science at the periphery is seen as a 'contributory' exercise, that is, it is assessed according to the quantity of information and material it contributes to the work of the theorists at the centre. Note that this contributing procedure does not give the periphery much 'power' in the sense of sharing in the success of the centre; one might even suggest that it does not give the periphery much cause to claim that it is part of the scientific exercise at all, for the history of science written in this way makes a clear distinction between the architects of science and the drawers of water and hewers of wood who provide the materials needed for the building.

In Australia, geographical isolation coupled with what has been seen as intellectual isolation ensures that colonial scientists are viewed from a perspective which casts them as 'bit' players in the developing drama of science and its spread and development. This has made it possible for Australian historians to accept simplistic, generalised models for the development of colonial science which promote the view that science flows outward from the metropolitan centre according to fixed rules. In this approach, it is assumed that science in the colonies is backward: geographical peripherality implies intellectual peripherality.

The reality is quite different. Science does not develop in a social vacuum according to evolutionary processes internal to it, but, rather, in particular socio-cultural settings which often determine the role, structure and form of science. Science in nineteenth-century Australia was the product of many factors, but the peculiarities of the colonisation process and the timing of key events must be allotted a significant role in its development. As an illustration of this, consider the creation of Australia's first universities in the period 1850 to 1860. If

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16 The Basalla model is used explicitly in this way by Ann Moyal, op.cit. note 6.
conservative social forces in colonial Australian society had succeeded in postponing this development for twenty years, then appointments to the senior positions within those institutions would have been made by committees of a very different composition from those that appointed McCoy and Halford. While still metropolitan in orientation, the result might well have been the institutionalisation of a very different view of biology, one that in the event received 'official' recognition only with the replacement of these earlier appointees in the 1880s. The progressive move to develop universities at so early a period in Australia's history, itself a product of socio-economic factors such as the discovery of gold, led to the entrenchment of a regressive theoretical structure in one of the official institutions of science. It would be hard to see this pattern of development, based on the occurrence of particular socio-cultural events, being repeated outside of Australia in just this way, and equally difficult to see how it might be fitted into any model of the Basalla type.

One advantage of the kind of analysis undertaken in this chapter, which takes account of a wide range of socio-cultural factors within a given society, is that it throws light not only upon the way the structures of science develop, but also upon the type of science that is undertaken and the philosophical framework that underpins it.

With this in mind, attention can be focussed on the work of individuals whose approach set them apart from the school of thought that dominated the official structures of Australian science. In most cases this meant that they worked literally outside of those structures, as amateurs, but in one prominent case this was not so, and the tensions engendered by his attachment to an institution under the control of men committed to a view of science radically different from his own provides a provocative topic for discussion.

GERARD KREFFT AND THE PROBLEMS OF BEING A COLONIAL DARWINIAN.

17 In the University of Sydney, William Haswell, a former student of Huxley, became Challis Professor of Biology in 1889, but he had been teaching Darwinism for some years prior to that date. At Melbourne, Darwinism became part of the biology syllabus after the appointment of Walter Baldwin Spencer to the Chair of Biology in 1888. For Haswell, see Ann Moyal, op.cit, note 6, Chapters 9 and 10. For Spencer, see D. J. Mulvanney and J.H. Calaby, 'So Much that is New': Baldwin Spencer 1860-1922, (Melbourne: Melbourne University Press, 1985). See chapters 8 and 9 of this thesis for further discussion.
The surviving correspondence between Darwin and Gerard Krefft amounts to some fifteen items written between 1872 and 1876. During most of this period Krefft, a German, was Curator of the Australian Museum in Sydney, but his term there was clouded by mutual hostility between himself and the Trustees of the Museum. Krefft claimed that he was converted to Darwinism after reading the *Origin*, but there is little evidence that he incorporated any evolutionary doctrine into his work before 1870. Only after that date did he become an active and aggressive supporter of Darwin, especially in the popular press where he used his regular column in the *Sydney Mail* to air discussion of evolutionary topics.¹⁸

Krefft's first letter to Darwin arose as part of a campaign to rally support for his own view that the fossil marsupial *Thylacalea* had been herbivorous and not, as another of his correspondents, Richard Owen, had claimed, carnivorous. There is some evidence to support the view that part of the reason for Krefft's acceptance of Darwinism lay in his continuing uneasy relationship with Owen.¹⁹ But to this can be added his apparent independence from strong religious and scientific commitments. Krefft came relatively late to natural history, beginning serious study only at the age of twenty-five. He arrived in Australia in 1852 after a short stay in America and worked on the goldfields before taking up employment in the National Museum of Victoria. There, working under its Director, Frederick McCoy, he catalogued the large natural history collection that he himself had donated to the Museum. He returned briefly to Germany in 1858, but was back in Australia in 1860, when he was appointed Assistant Curator of the Australian Museum in Sydney. Four years later he was made Curator, a position he held until his enforced departure in 1874.²⁰

Whether Krefft's brief trip home brought him into contact with the evolutionary and materialist doctrines then being discussed in the work of Moleschott, Buchner and Vogt is unknown, but in any event

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¹⁹ Krefft to Darwin, 15 May, 1872. DAR 169 Cambridge University Manuscript Room.

²⁰ G.P. Whitley & Martha Routledge, op. cit, note 18.
he returned to Australia with a comprehensive knowledge of the new approaches being adopted in Europe to the role and purpose of museums. Any hopes of introducing such innovations in Sydney’s premier museum were severely hampered by the Trustees and their colleagues. The Australian Museum was dominated by the Sydney scientific elite, led by William Sharpe Macleay, and it tended to reflect their interest in collecting and classifying natural history specimens. Krefft did little to disguise his contempt for these activities, at least in letters to his overseas correspondents. Darwinism was just one of the many issues that separated him from the men he described as ‘collectors of specimens and accumulators of hard names’ but it loomed sufficiently large for him to claim to Darwin that one of the reasons for his eventual removal from the museum was his rejection of the ‘God of Moses’ and his acceptance of the theory of development.

Krefft’s letters to Darwin reveal how deeply he was impressed by the explanatory power of evolutionary theory. He was especially struck by Darwin’s work on expression, and sent him several anecdotal pieces of information concerning a monkey at the museum which exhibited rage and jealousy by hurling stones and sardine cans. This information was followed by stories of intelligent pigs and horses, along with photographs of Aboriginal skulls (which Darwin passed to the anatomist George Busk in London). But while most of this material was intended by Krefft to support sections of Darwin’s work, he was not averse to offering critical comments when the occasion arose. For example he was quick to point out that Darwin was wrong when asserting that Australian natives were unable to count beyond the number four; according to Krefft, they had a complex system of counting in multiples which were distinguished by different vocal sounds. And Krefft was quick to see the relevance of his observations for other evolutionists’ work; through Darwin he attempted to interest Huxley in

21 Ibid.

22 Krefft to Darwin, 22 October, 1874. DAR 169, Cambridge University Manuscript Room.


24 Krefft to Darwin, 30 December, 1872. DAR 169, Cambridge University Library.
the bi-pedal tendencies of the Australian frilled lizard, which he believed had great evolutionary significance in the light of Huxley's suggestion that birds were probably descended from dinosaurs.25

Taken altogether this correspondence shows the extent to which Krefft observed through Darwinian eyes, a habit which often introduced tensions into his working relationships. As a regular contributor to the *Sydney Mail*, he occasionally fell foul of its proprietor, John Fairfax. In Krefft's view, Fairfax was 'rather a thorough believer in revealed religion, though he allows me to give an opinion now and then as long as I do not come it strong'. Fairfax censored Krefft's column on at least one occasion, in order to remove favourable references to Darwin26

As a scientist Krefft occupied a position far removed from that of the classical collector at the periphery. He was a theoretically sophisticated naturalist whose contribution to the zoological literature of Australia was substantial and of lasting value. His letters to Darwin were those of a colleague and fellow scientist, rather than a mere informant, and he took advantage of the existing networks of correspondence in attempting to further both his own career and the cause of science in the Australian colonies generally. Against the odds he remained vocal in championing new ideas. As a result he won an international reputation outside Australia, but was ultimately brought down by the entrenched interests of those he was committed to opposing. In a letter to Richard Lydekker in London, written six years after his forcible removal from the Museum, he complained bitterly and with some truth 'here in Australia you must follow the footprints of those ancient gentlemen who still follow Cuvier'. That comment is significant, for it shows that in the common perception Richard Owen's grip on Australian natural history had not yet loosened.27

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25 Krefft to Darwin, 3 May, 1873. DAR 169, Cambridge University Library. According to Darwin, Huxley was then too ill to respond to Krefft's information. Darwin to Krefft, 12 July 1873. M.L. Ref. No. Ad.1, Mitchell Library.

26 Krefft to Darwin, July-August ? 1873. DAR169 Cambridge University Library.

FROM ACCEPTANCE TO COLLABORATION: HOWITT AND FITZGERALD

Krefft's acceptance of Darwinism resulted in problems for his relationship with the proprietors of the museum which in combination with other factors brought about his downfall. By contrast, others working outside the physical architecture of colonial science were able to employ evolutionary theory to produce important work in the natural sciences. Two men who, like Krefft, gained international reputations by doing so were the anthropologist, Alfred Howitt and the botanist, Robert David Fitzgerald.

With the publication of his work on expression in 1872 Darwin's anthropological work came to an end, and when Alfred Howitt wrote in 1874, offering his services as an observer of the Australian Aborigines in the Gippsland district of Victoria, his offer was politely declined. Darwin urged Howitt to continue his observations, however, making the prescient comment that in doing so he might accumulate sufficient material to 'write a very valuable memoir or book' on the subject.28 Six years later Howitt and the missionary and amateur anthropologist Lorimer Fison fulfilled that prediction when they published their researches in Aboriginal society under the title Kamilaroi and Kurnai. Darwin's earlier response, and the divergence of the two men's interests, had nipped their correspondence in the bud, and Howitt and Fison turned instead for advice to the American, Lewis Henry Morgan, whose evolutionary view of society was then the subject of controversy in Europe. Morgan responded with more enthusiasm than Darwin had done and thereby initiated a correspondence lasting seven years, during which Howitt and Fison provided him with Australian ethnological material, incorporated into his later work.29

The reception of Howitt's and Fison's work in Britain was mixed; J.F. McLennan and John Lubbock were critical, opposing the


29 Much of the Fison/Howitt/Morgan correspondence is reproduced with discussion by Bernhard J. Stern, 'Selections from the Letters of Lorimer Fison and Alfred Howitt to Lewis Henry Morgan' in American Anthropologist, n.s. 32 (1930), 257-79 & 419-58.
Australians' use of Morgan's system of kinship analysis, but Edward Tylor and, later, James Fraser, were more enthusiastic. In Europe, Howitt and Fison were the source of much of the empirical data central to the cognitive anthropology of Emile Durkheim and Marcel Mauss. Howitt's career suggests analogies with the classical patron-client relationship - the collector at the periphery working with the assistance of powerful associates at the centre. Tylor, for example, provided material assistance by ensuring publication of Howitt's work in the *Journal of the Anthropological Institute*. Closer inspection, however, reveals a different picture, one that gives Howitt a greater role, and considerably more autonomy than the classical relationship permits. He appears as a primary contributor to the new anthropology emerging post-Darwin. Along with later workers such as Walter Baldwin Spencer and Frank Gillen, Howitt and Fison provided the Australian material and to some extent the analysis of that material, that Morgan, Tylor, Frazer, Durkheim and others were to incorporate into their own evolutionary studies of society. *Kamilaroi and Kurnai* became a standard anthropological text both for the new material that it contained and for the acceptance and development of Morgan's theoretical concerns that it displayed. When, in 1904, Cambridge University conferred upon Howitt the degree of Doctor of Science, in Baldwin Spencer's words it 'fully recognised the primary importance of his work'.

Howitt's admiration for Darwin's ideas was clearly the starting point for his anthropological work. In a letter to his sister in England in July 1874, he complained that the conservative nature of the Churches and their 'stubborn' clinging to dogmas were increasingly isolating them 'from the intellect of the country'. Turning specifically to Darwin's theories he added 'I take a very great interest in them, and

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feel satisfied of the main truth of the evolutionary hypothesis'. To his father at the same time he wrote:

"you and I need not enter into any discussion of Darwin's hypothesis - we might differ and after all, as I said, it is of no consequence. But I think you will agree with me (if I can manage to work it out properly) that the enquiry into the kinship system of the Aborigines clearly proves a great advance upon a former social condition."

In Howitt's view, social evolution was merely an extension of biological evolution; indeed it flowed as an inevitable consequence from it. At times, his descriptions of the destruction of Aboriginal society echo the worst excesses of the 'social Darwinists', taking for granted the inevitability of Aboriginal decline in the face of an encroaching 'superior' civilisation. The extent to which this progressive evolutionism is a product of Darwinism or part of the actual structure of the Darwinian theory is discussed more fully in Chapter 6; at this point it suffices to document Howitt's acceptance of evolutionary theory as an all-embracing philosophical structure within which to undertake scientific study.

In summary, Darwin provided Howitt with a philosophical framework for an evolutionary understanding of society. Within that overall scheme, Morgan offered his support and a theoretical model to work with, and this combination allowed Howitt to move beyond the position of simple collector. At a time when the new evolutionary anthropology was emerging, post-Darwin, in Europe and America, he was working at the periphery as an investigator of equal status (and in many ways a better equipped one) into the 'primitive condition of mankind'. Imbued with contemporary theories of biological and social evolution, Howitt differed notably from his colonial predecessors and indeed with many of his collecting contemporaries, the missionaries and government officials who provided Darwin with responses to his questionnaire, for example. Unattached to any scientific institution he was equally unattached to any 'creationist' programme of science. His work placed him firmly in the vanguard of the new naturalistic

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32 Howitt to Anna May Watts, July, 1874. Original in the La Trobe Library, Melbourne, Box No. 1047/3A.

33 Howitt to William Howitt, 7 July, 1874. Original in the La Trobe Library, Melbourne, Box No. 1047/3A.
programme of science and in a position at centre stage in the new anthropology.

ROBERT DAVID FITZGERALD: ORCHIDS, DESIGN AND DARWINISM

The last of Darwin's Australian correspondents to be discussed here is given the most detailed treatment if for no other reason than that he falls completely outside of the normal range of patron and client relationships and in many respects made the greatest use of evolutionary theory in scientific investigation of any single individual working in the continent during the period covered by this dissertation.

The factors that influence an individual's acceptance or rejection of a new world view will vary according to social background and life experiences and the psychological development sculpted from them. Nowhere is this more evident than in the reception accorded to Darwinism. Much energy has been expended in tracing out the influences that determined the attitudes of scientists to either the central core of the Darwinian thesis - natural selection as a sufficient mechanism for evolutionary change, for instance - or the deeper philosophical implications that were believed to emanate from evolutionary theory generally. It remains true however that no general list of factors exists that would allow one to predict what attitude a given individual is likely to take to these issues. Nevertheless, certain common factors do seem to coalesce into a theme in the biographies of many of those who accepted Darwinism as an alternative to other world views. The most obvious of these and the one most often misunderstood relates to religious belief; for many of the first generation of Darwinians evolution offered a way out of the dark sea of Tennysonian doubt. Huxley, Wallace, Bates and later, Romanes and Galton, were only the most eminent of this group. While Darwinism could not offer the consolation of faith to be found in the doctrines of the Church and the optimistic conclusions of traditional natural theology it did provide the basis for an alternative naturalistic conception of the world and man's place in it. Occasionally, as in the case of Leslie Stephen, the first impact of Darwinism was to introduce doubt about the possibility that order and design could be fathomed in the workings of the world; the second
impact however was usually to instil a stronger belief in a lawfully constructed universe albeit one lacking supernatural sanction.\textsuperscript{34}

Robert David Fitzgerald, surveyor and botanist, was one of the first Australians to turn to Darwinism both as an alternative to orthodox religious doctrine and as a potential source of inspiration in interpreting the natural productions of the continent. Fitzgerald was born in Tralee, in southern Ireland in 1830, the son of a well respected banker. The family generally were strong supporters of the Anglican church, but Robert David came to despise the sectarian tensions which he saw around him. While he maintained a belief in some form of creative force over and above the phenomena of the physical world, his religious feelings emerged from a worship of nature that was notable for its depth and breadth. At a young age, he actively pursued studies in geology, botany and ornithology, and he published numerous papers on these subjects in the local Irish journals. In 1856 the family emigrated to New South Wales where Robert joined the Lands Department as a surveyor.\textsuperscript{35}

Fitzgerald’s attraction to the study of orchids has been attributed more to accident than design but this is not strictly the case. On a bird collecting excursion with a friend in 1864 he became interested in a clump of the epiphytic orchid \textit{Dendrobium speciosum} growing on the bank of a river. This he took back to his home at Glebe Point, where it became the impetus to a lifetime study of the Australian branch of the orchid family, a study which culminated in the twelve part work which was to gain him an international reputation. While the finding of \textit{Dendrobium} may have set him on his way, the old adage that chance favours the prepared mind is applicable here because Fitzgerald was already a convert to Darwin’s theory and had read the first edition of \textit{On the Various Contrivances by which British and Foreign Orchids are Fertilised by Insects, and the Good Effects of Intercrossing}, published in 1862.\textsuperscript{36} This alerted him to the possibility of studying the Australian orchids from the vantage point of


\textsuperscript{36} Charles Darwin, \textit{On the Various Contrivances by which British and Foreign Orchids are Fertilised by Insects, and the Good Effects of Intercrossing}, (London: John Murray, 1862).
Darwinian theory; grasping the importance of this requires a short discussion of the importance Darwin himself placed on the peculiarities of the orchid group for the elaboration of some of the finer points of his evolutionary ideas.

Not all of Darwin's contemporaries were quick to see that the extensive researches he undertook into the plant kingdom after the appearance of the *Origin* were part of a strategy to outflank opponents. The philosopher of science Michael Ghiselin has called Darwin's work on orchids 'a metaphysical satire', intended to serve two purposes, one concerned with strengthening a major component of the theory of natural selection and the other aimed at undermining a traditional argument of the natural theologians.\(^37\) The first of these purposes, as the full title of the book shows, related to Darwin's belief that cross-fertilisation played a significant role in creating the right conditions for natural selection to act. By ensuring a constant mixing of the hereditary material the process increased the likelihood that the small continuous variations that Darwin's theory called for would arise. The bewildering number of ingenious mechanisms displayed by orchids for effecting cross-fertilisation were therefore an obvious field for intensive enquiry.

The second purpose alluded to above is what gave rise to Ghiselin's description. To accentuate the force of a naturalistic explanation of the process of speciation, Darwin needed to combat the age-old argument from design, with its emphasis on teleological explanations of structure and function. Ghiselin goes so far as to suggest that Darwin's orchid work was intended as a parody on the Bridgewater Treatises.\(^38\) According to Darwin, parts of an orchid's structure originally serving one purpose could, under the pressure of natural selection, come to serve an entirely different one. Over time gradual modification of the fifteen parts of the original 'ideal type' orchid would lead to the diversity of structures and habits that are now visible in the thousands of varieties of orchids currently identified.\(^39\) Those modifications amounted to using second-hand parts in adapting

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38 Ibid. 136.

39 Charles Darwin, op. cit, note 36, Chapter 7 for a full discussion of Darwin's views on the matter.
the orchid to new conditions, and therefore the 'special contrivances' so beloved of the natural theologians were an illusion. If this were so, then no evidence for design could be adduced from the structure of orchids however elaborate they might be, for the current use being made of those parts offers no clue to their past utility nor to their future prospects. If this were so, then no evidence for design could be adduced from the structure of orchids however elaborate they might be, for the current use being made of those parts offers no clue to their past utility nor to their future prospects. Thus the orchids that botanists were wont to marvel over for their exquisite contrivances were on this view merely the product of a long process of variation and selection. It is this assault on the doctrine of design and the concern with cross-fertilisation which Fitzgerald incorporated into his Australian work.

FITZGERALD'S AUSTRALIAN ORCHIDS

Australian Orchids appeared in two volumes of twelve separately issued parts between 1875 and 1894 (the last was published posthumously, Fitzgerald having died in 1892). The work followed no systematic pattern, the parts appearing as the different species and varieties were seen and described by the author. The fact that Fitzgerald drew all specimens from life in the belief that dried specimens gave an inadequate impression of the complexities of the family enhanced the drawings and drew special praise from admirers. On the completion of the first volume in 1882, Fitzgerald added a preface which included a dedication to 'the memory of the late Charles Darwin, as a token of the veneration in which that great naturalist and fearless expounder of science is held by the Author'. In the Introduction, written seven years earlier, the full extent of Fitzgerald's debt to Darwin and his commitment to the Darwinian project was spelt out in greater detail.

An expression by Mr Darwin of regret that he had not had the opportunity of examining an Orchid with an irritable labellum, and reference to the Australian Calaena in the very interesting and instructive treatise on the fertilisation of Orchids by that great naturalist has been my inducement to study the family with more

40 Ibid.

41 The history of Australian Orchids is given in Joe Betts, 'Robert David Fitzgerald (1830 - 1892)', The Orchadian, volume 5, No. 2, (1975), 10 - 12

42 Robert David Fitzgerald, Australian Orchids, (Sydney: Government Printer, 1882). The work was not paginated and is confusingly broken into volumes and parts, and the parts themselves into volumes.
than ordinary zeal in the hope of adding, as it were, a single stone to the great pile constructed by the boldest speculator of the age.43 When combined with the internal evidence in the work itself, these comments leave no doubt that the project was designed as a Darwinian exercise in botany. Repeatedly in the text, Fitzgerald related his findings to problems associated with an evolutionary interpretation of the orchid family, always with a view to undermining the teleological definition of structures and habits proposed by supporters of the creationist, or natural theological tradition. The result was praise from Joseph Hooker, and the satisfaction of seeing many of his ideas incorporated into the greatly expanded second edition of Darwin's own orchid work published in 1875. A gold medal at the International Exhibition in Paris in 1878 enhanced Fitzgerald's reputation still further.44 In Australia too, praise for the work was widespread notwithstanding the fact that many of its local admirers, including Mueller in Melbourne and William Woolls in New South Wales, were strongly opposed to the evolutionary views of its author.45

There is a very real sense in which the work stands as one side of a conversation between Darwinian and non-Darwinian world views; Fitzgerald's botanical excursions were usually undertaken in the company of Woolls or the equally anti-Darwinian Charles Moore of the Sydney Botanical Gardens and one can only guess at the extent to which Fitzgerald's published arguments for Darwin had been forged initially through discussion and debate with such men. Woolls placed on record both his admiration for Fitzgerald's work and his opposition to its inspiration, and seems to have been the archetype for the anonymous believer in design being combated throughout the Australian Orchids. Somehow, as later discussion will show, this little example of the warfare of science

43 Ibid.

44 L. A. Gilbert, op. cit. note 35

45 William Woolls was a close associate of Fitzgerald but a staunch believer in design in nature. He wrote a poetic eulogy for Fitzgerald on the latter's death in 1892 which included the lines 'His was, indeed, no common mind; His Philosophic eyes, Strove in development to find all natures mysteries And how from age to age each flower, Before these times began, displayed its reproductive power For others than for man'. Mitchell Library, Sydney. 581.995/W
FITZGERALD'S DARWINIAN PROJECT (1) THE PROBLEM OF CLASSIFICATION.

The orchid family is generally considered the most complex and varied in the plant kingdom. The extent of variation between closely related species and the easy ability to hybridise in the natural state creates even now serious problems for the systematic botanist, and many genera and species remain in a state of taxonomic turmoil. Fitzgerald seized on this confusion to pose a number of questions for his opponents. The genus *Lyperanthus*, for example, he described as 'an unsatisfactory intermediate genus' whose status was disputed by botanists, some placing it in one genus and others another according to which characteristic of the plant they wished to emphasise in classifying. In a tone of exasperation, Fitzgerald concluded that such subjectivity cast doubt on all genera except as an artificial device useful to systematists. In the plant kingdom as a whole, Fitzgerald conceded that distinctions between species or genera did often exist which were universally agreed on by botanists as allowing classificatory barriers to be drawn between closely related forms. Nonetheless, he argued that if all the past forms could be recovered such gaps would be narrowed to the extent that the confusion surrounding *Lyperanthus* would be extended to the whole kingdom. Thus, just as Darwin fell back upon the poverty of the fossil record to explain the gaps that distinguished existing life forms, so Fitzgerald resorted to botanists' ignorance of past forms of orchids to explain the gaps between existing species and genera. If all extinct forms were known they would presumably fill the gaps between currently disputed, closely related species or genera.

Uniting orchids which are distributed over two geographically isolated areas was also difficult; the genus *Adenochilus* unites the orchids of Australia and New Zealand, but the only two species in the genus (one in New South Wales and one in New Zealand)

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46 For a comprehensive overview of the current state of knowledge of the Australian orchids see David L. Jones, *Native Orchids of Australia*, (French's Forest: Reed Australia, 1988).

47 Robert David Fitzgerald, op. cit, note 42, volume 1, part 1, volume 1.
were sufficiently distinct to suggest that they had been long separated.\textsuperscript{48} The distinction could be explained by geographical isolation which the Darwinians believed played a major role in the formation of new species. Fitzgerald used the example of the spider orchid, \textit{Caladenia cucullata}, to further illustrate the point, by showing that the new (that is, the latest to appear) forms often retain a large enough number of the old characteristics to 'cause naturalists to doubt their separate identities'.\textsuperscript{49} The 'ancient' genus \textit{Cyrtostylis}, which has only one species widely distributed throughout Australia, showed no variation and was used by Fitzgerald to show that constancy of type in a species could be accounted for by assuming that they were 'monuments of former connections' or 'exemplars of either total or partial reversion to a former type'.\textsuperscript{50}

Discussing the sun orchids, \textit{Thelymitra}, Fitzgerald drew attention to the fact that the group showed 'wild' variation in the forms of fertilisation but maintained a close physical resemblance. The fact that some species within the genus depend entirely on insects for fertilisation while others are only occasionally visited and others never at all, suggested to Fitzgerald that botanists should take more seriously the role of different strategies for fertilisation when drawing up markers of 'development' within the order. In any event, the wide array of such strategies displayed by the \textit{Thelymitra} illustrated, according to Fitzgerald, the 'spurious' nature of the distinction between species and varieties.\textsuperscript{51} The species \textit{Caladenia ixiodes} was another which fell into this category, showing only minute differences from \textit{Caladenia gemmata} with which, according to Fitzgerald, it ought to be united as a single species.\textsuperscript{52}

With so little agreement among botanists over the true status of many genera, species and varieties of orchids, Fitzgerald suggested that the only true test (at the level of species) was constancy of type, where one form is not produced from the other. The difficulties of

\textsuperscript{48} Ibid.

\textsuperscript{49} Ibid. part 2, volume 1.

\textsuperscript{50} Ibid. part 4, volume 1.

\textsuperscript{51} Ibid. part 4, volume 1.

\textsuperscript{52} Ibid. volume 2, part 4, volume 4.
establishing even this criterion for the riotously variable orchids were immense as he was well aware and the suggestion merely served to underline what he regarded as the fundamentally artificial division into doubtful categories that so often frustrated the field botanist. Darwin had played the same tune in the Origin and Fitzgerald was simply amplifying it with reference to a group that was particularly difficult to classify.

FITZGERALD'S DARWINIAN PROJECT (2): ADAPTATION, DESIGN AND CREATION.

In 1879 William Woolls published a small volume entitled Lectures on the Vegetable Kingdom with Special Reference to the Flora Of Australia. Like Fitzgerald, Woolls earned an international reputation for work on the Australian flora, including a doctorate from the University of Gottingen. Unlike Fitzgerald however, Woolls, an Anglican clergyman, refused to accept the Darwinian thesis and continued to argue for the existence of design and purpose in nature. As he put it in the Lectures,

I am aware that some of Mr Darwin's followers pretend to see in the rudimentary organs of plants and animals ... a want of design. It does not follow however that because we cannot in the present state of science discover the uses of every organ in animals and vegetables they are useless ... Far from it. I think the legitimate conclusion is that, whilst we see around us innumerable instances of wisdom and design there is every reason to believe that nature has made nothing in vain ... Nothing can exist but by the will of Him who pronounced all things good.

Fitzgerald was undoubtedly the Darwinian in question, for Woolls went on to condemn those 'flippant writers of the present day...who believe that some parts of an organism were 'relics of properties which were necessary in ages past, or a kind of rudimentary organ, which is now to be regarded as useless because forsooth we cannot trace design in it'. Emphasising the

53 William Woolls, Lectures on the Vegetable Kingdom, with Special Reference to the Flora of Australia, (Sydney, 1879).


55 William Woolls, op. cit, note 53, 90.
different approach between himself and Fitzgerald, Woolls concluded that 'Everything around us is full of Deity. We live and move and have our being in the Divine Essence'.

As indicated earlier, Fitzgerald honed his Darwinian arguments directly in response to the creationism of his friends, of whom Woolls was the closest. His investigation of the Australian orchids was used as a direct attack against design and natural theology. Adaptations were not due to the workings of the divine mind. Structures which in one species of orchid could be explained by recourse to divine forethought were often virtually useless in closely allied species. For instance, the species Calanthe veratrifolia appeared to have a sham nectary which no longer acted as a receptacle for holding honey but still attracted insects, allowing the plant to continue to be fertilised by normal means. More striking still was the sun orchid Thelymitra carnea, which often developed blooms right up to the point of flowering, but which then failed to open. If the colouring of a plant acted as an agent for attracting insects, of what use was it to Thelymitra carnea to develop its full colour only to allow the unopened flower to whither on the stem without having the benefit of insect visitation? If design was to be invoked to explain the successful adaptation of flower to insect in normal cases to what were such unsuccessful cases to be attributed?

Fitzgerald's response to this conundrum was to explain it as an example of the inheritance of a structure once useful to the plant but now fallen into disuse and continuing to exist only in a degenerate form. This explanation was in line with the Darwinian principle that discarded organs would continue to be inherited provided that they were not harmful to the organism, in which case they would be acted against by natural selection. As Fitzgerald put it when explaining the continuing growth of the stem of the genus Coryanthes after the death of the flower - an apparently useless activity - 'To the disciple of Darwin it may appear to be one of those peculiarities that are not, never have been, have ceased to be, or are not as yet, of any use to the plant'.

56 Ibid. 91 & 112-13.
57 Robert David Fitzgerald, op. cit, note 42, volume 1, part 4, volume 1.
58 Ibid. volume 2, part 1, volume 2.
59 Ibid. volume 1, part 1, volume 1.
Structures that appeared to be not only useless but positively harmful (or at least inhibitory) to the continuing existence of the plant were also difficult to explain on the assumption of design. In the orchid Prasophyllum fimbriatum, the labellum, normally used as a platform by insects for reaching into the nectary is placed in a manner which actually bars the way of the visitor. Only small insects able to crawl under the labellum can act as agents of fertilisation; Fitzgerald asked if the process of fertilisation would not be improved by the removal of the labellum, which as it stood was 'of very doubtful advantage' and once again, very difficult to explain on the theory of design. On the other hand, from an evolutionary perspective, Prasophyllum might be understood as in an intermediate stage of development.

Difficulties associated with classification and the unsatisfactory nature of the argument from design in explaining non-adaptive structures provided Fitzgerald with a springboard for promoting the Darwinian theory. To what extent he asked, did the confusion surrounding the classification of the orchids find a solution in the suggestion that varieties are only, in Darwin's terms, 'incipient species'? Referring to the species Pterostylis cycnocephala, Fitzgerald argued that in deciding the Darwinian question the botanist must determine whether approximate forms pass into one another or remain constant, or again, depart more and more from each other. Does a variety become a species? In Pterostylis cycnocephala and Pterostylis mutica the labellum turns down and up respectively but in most other respects the two species are identical. Traditionally they have been distinguished by the naturalist by the addition to the description of the comment that 'the appendage variable either turned up or down'; Fitzgerald claimed this was inadequate, for the real test of species was whether one of the forms ever produced the other. If not then they are genuinely separate species. The problem displayed by Pterostylis cycnocephala and mutica was compounded in the two species or varieties Caladenia alba and Caladenia carneae. Externally they show few signs of being distinct from each other, but (a) they flower at different times, (b) they differ in that one is predominantly white but occasionally pink while the other is the reverse, and (c) one has a larger flower and a slightly different labellum. According to Fitzgerald, the explanation for the

60 Ibid. part 5, volume 1.
61 Ibid. part 2, volume 1.
differences probably lay in the constitution of the pollen but, whatever the reason, their classification as species or varieties remained problematic. This was 'the fulcrum of the Darwinian theory' and on it 'depends the proof or otherwise of change so often demanded by its opponents'. But as Woolls' position made clear, accepting the Darwinian explanation was not forced upon botanists however much they might recognise the difficulties raised by Fitzgerald. A creationist view was an assumption about the essence of the natural world; within that view one might, like the American botanist Asa Gray, accept Darwinism as a divinely sanctioned causal mechanism for the origin and development of organisms, or, like Woolls, reject it as an unsatisfactory solution. Either way, empirical evidence was rarely if ever at issue, for the problem was as much to do with personal philosophical commitment to both religious and scientific epistemologies as it was to do with simple criteria of proof.

THE CORRESPONDENCE WITH DARWIN AND DARWIN'S USE OF FITZGERALD'S MATERIAL.
Between July 1875 and February 1881 Darwin wrote at least four letters to Fitzgerald, while two letters from the Australian botanist survive amongst the Darwin correspondence at Cambridge. Darwin's letters are always in response to receipt of the latest instalment of *Australian Orchids*. Only two, coming six years apart, discuss the work in any detail. In July 1875 he wrote a belated note thanking Fitzgerald for part one, expressing his 'astonishment' that 'such a work could have been prepared in Sydney'. He was particularly struck by the account given of the movements of the labellum in generic groups *Pterostylis* and *Caladenia*, and suggested that Fitzgerald carefully examine the flowers of these to ascertain whether they showed signs of having been sucked by insects. When later that year Darwin brought out a second edition of his own orchid book he included a discussion of Fitzgerald's experiments with *Caladenia dimorpha*. Fitzgerald had watched a house-fly struggle to free itself from the sticky residue of gluten on the stigma of one plant; in so doing it removed the pollen from the anther and smeared it on the stigma of the same plant. He was adamant that only by some such means could the species be enabled to set seed. Darwin, ever suspicious of the suggestion that plants might be

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62 Ibid. part 7, volume 1.
63 Darwin to Fitzgerald, July 15, 1875, Mitchell Library, Ref. No. A2546.
habitually self-fertilised, rejected the interpretation proposed by Fitzgerald and turned to analogy with other orchids which suggested that 'insects usually behave very differently from the fly' witnessed by the Australian, 'and no doubt they carry the pollen masses from plant to plant'.

Fitzgerald's response to this is unknown, but present day research suggests that the species of the genus in question have variable modes of fertilisation, including habitual self-fertilisation.

In the same letter Darwin took up Fitzgerald's discussion of the sun orchid, Thelymitra, the flowers of which often fails to open. Once again he suggested that experiments be undertaken, this time to ascertain whether environmental conditions had an effect on the regularity of this occurrence. Fitzgerald argued that Thelymitra carnea invariably self-fertilises when the pollen crumbles onto the stigma, but added that the species is equipped with all the components necessary for insect pollination. The picture that emerged was of a species caught between two poles, half-way between a self and cross-fertilising stage. On the other hand, the closely related genus Diuris is dependent on insect agency for fertilisation, and there is evidence that fertility is adversely affected by constant self-fertilisation. Thelymitra carnea invariably produces abundant seed capsules but was rarer than Acianthus fornicatus, a cross-fertilising species that produced fewer capsules. The same applied to Phaius grandifolius (self-fertilised) and Calanthe veratrifolia (cross-fertilised). Darwin quoted this evidence in support of his claim that cross-fertilised species had increased fertility, a point stressed by Fitzgerald: 'it seemed to me that the good derived from cross-fertilisation was increased fertility in the seed itself, thereby making the smaller proportion of seed produced by crossed species of more avail than the larger quantity from species always reproduced from themselves.'

The next three letters from Darwin were no more than acknowledgments of the receipt of parts of Australian Orchids. Then in

64 Charles Darwin, *The Various Contrivances by which Orchids are Fertilised by Insects*, (London: John Murray, 1877). References to Fitzgerald occur on pages 89-90, 114-15, 127, 279-81. The quotation is on page 89.

65 Robert David Fitzgerald, op. cit, note 42, volume 1, part 4, volume 1

66 Ibid. part 2, volume 1.

67 Ibid. Introduction.
February 1881 he made an important concession to Fitzgerald, admitting that self-fertilisation probably occurred more often than he had previously been prepared to accept. Suggesting an explanation for this, Darwin resorted to invoking the idea of Australia as a biologically primitive continent; self-fertilised species might survive for long periods unless subjected to severe competition. Fitzgerald must have been pleased with this admission, and probably even more with Darwin's reluctant acceptance in the same letter that some structures in the orchids described by Fitzgerald, notably in the species Sarcochilus divitiflorus, had no apparent evolutionary significance. This was precisely the point the Australian had made in relation to the genus Coryanthes (see above) Darwin was able to use only the earliest part of Australian Orchids when revising his own book for a second edition so that reference to it is limited. There is no doubt, however, that he was impressed by the quality of the work, and at times worried by the conclusions it contained. It forced him to revise some strongly held views on the fertilisation strategies used by plants for maintaining their existence. On Fitzgerald's side, the evolutionary framework provided by Darwin's work stimulated him to investigate and provided him with a framework for understanding the origin and development of the Australian orchids. For all that, he was not inhibited from disagreeing with his distant mentor, and had the satisfaction of winning concessions from him. In his acceptance and clear grasp of the Darwinian theory, Fitzgerald was one of the earliest Australians to make a real, conscious effort to contribute to the development of evolutionary theory. His success refutes the oft made claim that colonial botanists were little more than collectors for European savants; while that may have been true of James Drummond, a professional collector, it was manifestly not so in the case of Robert David Fitzgerald, an amateur botanist. His relationship to Darwin was based on collaboration rather than deference (despite the somewhat fawning dedication of Australian Orchids to the English naturalist), and he must be considered an investigator whose opinions had to be taken seriously even to the point where they altered those of 'the greatest naturalist of the age'

CONCLUSION

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68 Darwin to Fitzgerald, February 9, 1881, Mitchell Library Ref. No. A2546.
In this chapter I have sought to show that there is a pattern of colonial science which does not fit easily within well-known models of scientific development. By concentrating on a narrow area of science - the impact of Darwinism on the work of some of Darwin's Australian correspondents - it has been possible to suggest that there was a deviant tradition in Australian science in the second half of the nineteenth century, running contemporaneously with an orthodox tradition represented by institutional and personal commitments to a dominant scientific tradition that can be broadly termed creationist. Those who were uncommitted to this dominant tradition tended also to be outside of or uncommitted to the institutional bases of science and were therefore free to pursue their scientific interests without the constraints imposed by those factors. This is not altogether true of Gerard Krefft, and his controversial career and spectacular downfall may have been due in part to the tensions engendered by his scientific heterodoxy (as he appears to have recognised).

The term 'heterodox' should not be taken to imply that the work of these men failed to gain the respect of those opposed to the philosophy within which it was undertaken. On the contrary, it was often greatly admired, a fact which points up the care that needs to be taken when attempting to recreate the social context in which scientific controversy takes place. Widely opposing positions are not necessarily destructive of dialogue. This is especially true in the case of Fitzgerald, whose work illustrates clearly the distinction between the waning creationist programme of science and the waxing naturalistic programme. Fitzgerald had a good grasp of the Darwinian theory and understood clearly both its possibilities as a research programme and its radically different philosophical stance to the creationism of the majority of his colleagues, and by extension the broader implications that could be drawn from it. In all these areas he stood outside the mainstream of the science of his day, but succeeded nonetheless in maintaining close friendships with men who strongly repudiated the programme of science he was committed to pursuing.

Roy MacLeod has recently revived interest in understanding the development of science at the periphery, through an analysis which embeds it in the broader framework of British imperial ambitions. In doing so, he has once again drawn attention to the role played by power brokers at the metropolis in the development of colonial
science. At the same time he has hinted at the shifting of power from the hands of those such as Richard Owen, who pursued science within a creationist framework, to those such as Huxley, who led 'the advancing forces of scientific naturalism'. That shift in power was reflected in Australia by the involvement of men like Krefft, Howitt and Fitzgerald in the programme of naturalism as it applied to the biological sciences. The colonial institutions that represented the public face of science became committed to naturalism only in the last two decades of the century. In the 1880s, power to make appointments to Australian scientific institutions still resided at the metropolitan centre, though by then it was in the hands of men with a radically different view of science from those who appointed the earlier generation. The new men who came to take up institutional positions at the outpost of empire brought with them a background in the biological sciences that grounded them firmly in the camp of naturalism. They were not, however, the first colonial scientists to embrace the doctrines of naturalism, as this paper has shown, and thus did not introduce a new 'period' for Australian science (though perhaps they did do so in the limited area of university-based science).

Those who seek to understand the spread and development of Western science in terms of the apparent sophistication of a given period and place need to recognise that there may often be such a heterodox tradition at work alongside the orthodoxy represented by the governing personalities and institutions of the day. Given that fact, it will no longer be a surprise to find that there are colonial-based Kreffts whose view of science makes them more 'advanced' than metropolitan based Owens; Howitts who are more sophisticated anthropologists than the members of the London Anthropological Institute, and amateur Fitzgeralds who are more 'progressive' than some professional botanists at the centre. Seen in this light, the relationship between 'centre' and 'periphery' may become for the historian a more interesting and dynamic area of study.

Having devoted two chapters to Darwin's own involvement with Australian resources, human and material, one can now turn to the issue of Australian responses to Darwinism as they were publicly

manifested in a number of controversies. In the next chapter I will deal with the Australian response to what many scholars see as the central issue associated with Darwinism, namely, man's place in nature.
Darwinism arrived in Australia very soon after its first appearance in Britain, the Origin of Species being on sale in Sydney within five months of its publication. It quickly became a conversation piece among the Australian intelligentsia; 'the book of the season' according to the artist Conrad Martens in a letter to Darwin written from Sydney. Sixteen years later the future English theatre critic William Archer, then visiting Australia noted that the typical squatters library contained among other volumes 'An encyclopaedia, Shakespeare, Macauley's England and Essays, Mill's Political Economy, one or other of Irwin's works.' These are of course anecdotal or impressionistic observations, but nonetheless they provide some support for the claim which, as the following discussion will show, can be made on evidence drawn from more specific sources such as private correspondence and press and specialist journal coverage, that discussion of Darwinism became a significant part of the intellectual culture of the Australian colonies in the two decades following 1859 just as it did elsewhere. The case dealt with in this chapter illustrates a number of the key issues that lay at the heart of almost all debates, both private and public, involving the Darwinian theory.

In July 1863, George Britton Halford, the first medical professor at the University of Melbourne, challenged the findings of Thomas Henry Huxley's book, Evidence as to Man's Place in Nature. Applying the methods of comparative anatomy, Huxley concluded that

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1 The Sydney Morning Herald for the 18th April 1860, carries an advertisement for John L. Sherriff, Bookseller & Stationer, in which the Origin is listed as 'Now Available'

2 Martens to Darwin, 20 September, 1862, DAR 171, Cambridge University Manuscript Room.

'the differences that separate man from the gorilla and the chimpanzee are not so great as those which separate man from the lower apes'.

Using the same approach, Halford countered with the claim that the evidence in fact suggested that there were crucial differences between man and the apes which effectively negated Huxley's conclusions. In the wake of Halford's first public lecture in Melbourne on the issue, a public controversy erupted which embroiled a wide cross section of the social and intellectual elite in Melbourne.

Historians studying the reception and impact of Darwin's Origin of Species in Britain have increasingly come to recognize that the question of man's place in nature underlay all discussions of evolution. The question led to differing interpretations of man's physiological and genealogical relationship to the lower animals, and discussions of these were inextricably bound up in a matrix of debates involving religion, philosophy and political economy. Physiology, anatomy or morphology may have provided the scientific pegs upon which various evolutionary arguments were hung, but it was the moral and social implications of those arguments that generated the heat which often accompanied scientific debates and made them of interest to a wider audience.

In this respect, the nature of the debate in Australia was no different. In the case under discussion here, it is evident that the apparently trivial, and to modern minds slightly odd, question of whether or not monkeys have feet finds its meaning and significance only because its discussion is embedded in larger cultural values. At the same time, the case of the monkey's foot throws light on another aspect of nineteenth-century science - that of scientific colonialism. It represented an opportunity for Halford, an émigré British scientist, to establish his credentials among colonial Melbourne's cultural elites. However, it is suggested in this chapter that Halford's success in Melbourne was achieved only at the expense of his international aspirations. If correct, the claim highlights the extent to which changing attitudes to the question of what science really is about were themselves more than merely academic. As science changed in its professional and institutional aspects, in part as a response to major theoretical upheavals such as Darwinism represented, so its

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practitioners and leaders perfected the means of including and excluding groups and individuals from its activities on the basis of adherence to, or rejection of, the new rules.

THE BACKGROUND TO THE CONTROVERSY: HUXLEY AND OWEN

After publication of Darwin's *Origin* an evolutionary edge was added to a debate about the correct classification of man that had surfaced periodically since the seventeenth century. In the 1850's, a controversy based on comparative anatomy had flared up in this area between Richard Owen and Huxley, Owen maintaining that significant anatomical differences could be demonstrated between man and the 'higher' apes, while Huxley held that the differences between man and the higher apes were less significant than the differences between the higher apes and the lower monkeys. The most important area of dispute between them lay in Owen's claim that the ape's brain lacked certain structures that were to be found in the brain of man. By the time his book on man was published, Huxley had effectively won this particular battle by convincing the majority of his scientific peers that the disputed structures were present in the ape's brain, and he appended a summary of the controversy to the second chapter of his book. The victory over Owen was a significant one for Huxley and those pushing for a more secular scientific attitude. There were, however, other areas that remained in dispute between anatomists over the correct classification of man, and Huxley alluded to one of these, namely the question of whether the hind-limbs of the higher apes terminated in a true foot or in a structure better understood as a hand. It was this part of the anatomical debate about man that Halford carried to Australia, and which provided the grounds for his disagreements with Huxley and his evolutionist supporters in Melbourne.

When *Man's Place in Nature* was first published in Britain its author's thesis did not go unchallenged, and scientific and literary journals such as the *Reader*, the *Athenaeum* and the *Quarterly Review*, devoted considerable space to airing the arguments for and against it. In many ways this dispute 'made' Huxley as a scientific figure of public stature in Britain and was an important factor in his lifetime crusade

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for acceptance of Darwinism in particular and scientific naturalism more generally. Both issues were seen in some quarters as a threat to the traditional common context of Victorian society.6

The point has already been made that the cultural matrix of nineteenth-century Australia was composed of elements largely British in origin and it is not surprising that Australians should react to perceived threats to it in much the same way as their British contemporaries did. By going to the heart of the evolutionary debate - man's place in the scheme of things - Halford was initiating for the first time in Australia a full-scale public debate of the wider issues involved. At the same time, like Huxley, he was staking a personal claim to be seen as an authority in science, albeit in a smaller social and cultural context. In the narrower confines of colonial society, that claim was not dependent on the 'truth' (publicly perceived) of his position. Rather it was based on his ability to initiate and sustain debate in a social and intellectual climate that was generally, though not exclusively, favourable to his position. As I shall show, Halford was highly successful in achieving his aims within the colony, but in doing so he brought into question his own credibility within the wider circle of British science.

HALFORD'S CRITIQUE OF HUXLEY
In his analysis of man's relationship to the ape, Huxley had claimed that when discussing anatomical structures he would avoid all mention of those that were 'eminently variable'. By this he meant that he would be concentrating on so-called 'primary structures', ignoring those that were sometimes absent and sometimes present within a group. Using this criterion, he rejected the view of some anatomists that the hind limbs of the ape terminated in a hand-like structure rather than a true foot, asserting instead that the similarities to a human hand were superficial. He then set down his own reasons for believing them to be true feet. These were that they shared with the human foot a similar arrangement of the tarsal bones, and had the short flexor and extensor muscles of the digits characteristic of a foot rather than a hand. Finally,

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6 Robert M. Young, op.cit, note 4.
and for Huxley conclusively, they possessed the peroneus longus muscle, used in balancing the body and flexing the foot.7

Halford responded to Huxley in four lectures, the first of which was delivered at the university before an invited audience which included 'the Chancellor and about fifty other gentlemen'.8 He began by agreeing that the features designated by Huxley as crucial in determining the status of the human foot were present in the hind limb of the ape. However, according to Halford, one of the chief muscles of the human foot, the transversalis pedis, was absent in the hind limb of the 'monkey'. Thus while the 'monkey' possessed some footlike features, it lacked others; and what is more, it had some features suggestive of hands. For Halford, this was sufficient to prove that Huxley had missed or deliberately avoided reference to crucial evidence that went against his conclusions, and that omission, when coupled with the fact that the muscles in the monkey's hind limb had greater mobility relative to the same muscle in man, suggested that the terminal division of the monkey's hind limb was as much hand-like as foot-like. Halford therefore rejected the terms 'bimanous' (two-handed) and 'quadrumanous' (four-handed) as applying to the monkey and suggested instead that these creatures be defined as 'cheiropodous' or 'finger-footed'.9

Even at this early stage in the dispute, there were obvious areas of concern about which the two professors would never agree. Huxley had dismissed the greater mobility of the monkey's hind limb muscles as part of the superficial similarity between it and the human hand. As an evolutionist his concern was with primary structural similarities that suggested genealogical relationships, not recent secondary adaptations that could be accounted for, he believed, in terms of the Darwinian principle of descent with modification.10 For Halford, working within a programme in which he wished to preserve a role for

7 Thomas Henry Huxley, op. cit, note 5, Chapter 2, especially pp.89-91.
8 *Age*, 17 July, 1863; *Argus*, 17 July 1863.
9 *Age*, op. cit, note 8.
10 Huxley's views are spelt out in chapter 2 of *Man's Place in Nature* That he deliberately eliminated from his discussion all 'eminently variable structures' is made clear in a letter to C.S. Woods dated 23 October 1863 and published in the *Argus* on 4 February 1864.
teleology and designing forethought, function was as important as structure and therefore the shape and size of the structures themselves were also of crucial importance. When he concluded his first publication on the subject by drawing attention to the Creator's purposes in designing the limbs of man and ape to serve different functions, he was highlighting the extent to which he and his adversary were arguing from incommensurable positions.  

A second area where problems arose concerned terminology. Halford's direct knowledge of primate anatomy was limited at this stage to dissections carried out on two macaque monkeys and his comments on gorillas were largely extrapolated from these. Critics were quick to point out that the term 'macaque' itself covered a large genus containing many species, and Halford's failure to identify the species to which his macaques belonged was seen as a major weakness in his case. More confusing than this, however, was the lack of precision, on both sides of the dispute, when dealing with the great apes which were, after all, the linch pin of Huxley's argument. 'Monkey', 'monkey-tribe' 'simian-tribe' and 'ape' were used interchangeably throughout, on occasions even by Huxley. If nothing else, this offers further support to the claim made in this chapter that the argument at its most meaningful level was not about specific anatomical issues relating to gorillas and man but about wider concerns with man's place in nature.

In its own way, this argument between two anatomists over the relative importance of bones and muscles illustrates the complexity of the debate about evolution. On one level it appears as a dispute over taxonomy and the correct procedures to be followed in zoological classification - what counts as evidence one way or the other -, and the roles to be assigned to form and function. But even here it is not possible to separate the arguments from the broader considerations mentioned above; it was always the implications - religious social and so on - that were paramount. What inferences might be drawn about man if it could be shown that he shared a common ancestry with the apes? And, what

11 George Britton Halford, Not Like Man, Bimanous and Biped nor yet Quadrumanous, but Cheiroponous, (Melbourne: 1863), 16.

12 Criticism of Halford's use of the term 'Macaque' in an overly general way can be found in the Lancet, 12 December, 1863, 681-83.
would be the result of broadcasting those inferences to the general population? Halford concluded his first lecture by urging his audience to reject any idea that there was any lineal descent from ape to man. He condemned Huxley's book, for it had 'tendencies' that suggested that it 'might have been written by the Devil'. Consigning the supporters of evolution to the forces of darkness was not unusual in some of the early religious responses to Darwinism, but it was rarely spelt out as clearly as this. Although Halford maintained his general position throughout, he tempered his rhetoric in some of his later talks, possibly in response to press criticism including some from quarters otherwise sympathetic to his cause. 

A month later, during a public lecture in Melbourne, in which he repeated the bulk of his earlier claims, Halford received support, secular and spiritual, from scientific, religious and social leaders in the city. Frederick McCoy, the anti-Darwinian Professor of Natural Science at the University and Director of the National Museum of Victoria, overrode normal museum practice, and allowed Halford to use stuffed and skeletal material from the Museum. During the discussion that followed Halford's talk, the chief spokesman for the Presbyterian Church in Melbourne, Adam Cairns, outlined what to him were the weaknesses of the 'development hypothesis' and insisted that it was the 'higher faculties' that separated man from the apes. This was a view endorsed by most of Halford's supporters throughout the controversy, and represents the closest that the anti-evolutionary forces came to stating their real concern in an unmediated form. That is, their fear of the social and moral consequences if Huxley's position were proved to be correct or became accepted orthodoxy. Huxley had, in fact, drawn attention to 'the vastness of the gulf between civilized man and the brutes' but denied that there was any psychical distinction that could not be accounted for on evolutionary theory.

13 Argus, op.cit. note 8.

14 Age, 30 July, 1863.


16 Argus, 1 August, 1863.

17 Huxley, op.cit, note 5, 109-10
Halford's second lecture was presided over by Sir Henry Barkly, the Colonial Governor of Victoria. Well known for his support for science, Barkly was nonetheless antagonistic towards evolutionary theory, and closed the meeting with a short speech clearly favouring Halford, thereby ensuring that the new professor's position had the broad support and sanction of some of the most significant public figures in scientific, religious and political circles in the colony. Barkly's was not to be the only vice regal voice raised against the evolutionists in this affair. William Denison, a former governor of New South Wales, wrote an anti-Huxley parody from his new diplomatic base in India. Among the general population, support for Halford was not so complete and as a consequence the colony witnessed the rare spectacle of a major scientific controversy being played out in the local press.\(^\text{18}\)

THE PRESS REACTION

The two Melbourne newspapers, the *Age*, under the control of David Syme, and the *Argus*, whose senior proprietor was Edward Wilson, took opposing sides from the beginning. According to the *Age*, the issues raised by Halford were both complex and important as the subject 'must necessarily have great influence ... on the minds of the public'. 'Clear and decided opinions' could only be reached when all the evidence was available, but nonetheless, according to the paper, the theory propounded by Huxley was 'pernicious' and the logic behind it faulty, for there was no reason to suppose that identity of structure implied community of descent, which the *Age* recognized as Huxley's major thesis. This being so the theory could do untold harm if allowed to fall unchallenged into the hands of the credulous, and Halford was to be congratulated for his stand against it.\(^\text{19}\) In an article entitled 'The Antiquity of Man', the *Age* professed scepticism as to the likelihood of the transmutation of monkeys into men 'through the operation of laws latent in nature'.\(^\text{20}\) Quoting the anti-Darwinian French naturalist Armand de Quatrefages, the paper followed Adam Cairns in insisting

\(^{18}\) *Age*, 1 August, 1863. Denison's contribution to the affair is detailed in the *Age*, 4 August, 1863.

\(^{19}\) *Age*, 18 July, 1863.

\(^{20}\) *Age*, 30 July, 1863.
that the moral and intellectual endowments of man, which it earlier described as providing 'an impassable chasm' between man and monkey, should be allowed 'due weight' in any classification of the human species. It again urged caution when informing its readers that the palaeontological findings of Boucher de Perthes, which had suggested a long ancestry for man, had been accepted only after careful scrutiny by geologists 'fully aware of the anti-Biblical uses to which they might be put'. The Age was at pains to point out that it was not suggesting that such enquiries as those of Huxley and de Perthes were illegitimate areas for scientific enquiry; after all, it was 'in speculative researches and in the eagerness to challenge even the mysteries of existence that Mankind infinitely transcends all orders of the lower animals'. Accordingly, the Age insisted that reason not instinct gave humanity its place at the head of the assemblage of the family of mammals. In short, for the Age, 'it mattered not how near we are to monkeys so long as we are different from monkeys.21 Quoting from another Syme publication, the Leader, it dismissed Huxley as an unoriginal thinker who had achieved publicity by 'undertaking to carry out the theory of Darwin [sic] and of the author of the Vestiges as to the development of Man from the inferior animals'.22

It does seem clear however, that the Age understood that the dispute encompassed all the issues relevant to the wider context always implicit in discussions about evolution. While supporting Halford's anatomy against Huxley's it was nonetheless concerned to spell out a fall-back position which effectively ensured that, should Huxley prove to be correct, it would leave the wider question of man's place in nature unanswered. The moral and intellectual capacities of man provided the 'impassable chasm' that served as the final arbiter of his unique status. The dire consequences that might follow should the 'pernicious' theory fall into the hands of the 'credulous' did not need to be spelt out. In Melbourne, the prevalence of free-thought and sectarian disputes were already seen as a potential threat to organized religion.23

21 Age, 4 August, 1863.

22 Age, 30 July, 1863.

At the same time, the rapid growth of the colony following the discovery of gold in the previous decade was a cause for concern to those who sought to maintain social and class structures in an effort to ensure social stability. If the religious basis of society were undermined, then the outlook for social stability was bleak. David Syme, the proprietor and driving force behind the *Age*, maintained a lifetime of hostility to the Darwinian theory of evolution by natural selection, seeing in it an attempted legitimation of the law-of-the-jungle social ethics that he was constantly railing against when opposing the promoters of laissez-faire economics and free-trade. As will be shown in Chapter 5, in later years Syme proposed his own theory of evolution, one which rejected the concept of struggle in favour of internal drives. His strong anti-Darwinian views, allied to his grip on the editorial policy of the *Age* at this time goes some way to explaining why a newspaper with a reputation for promoting liberal if not radical views should be so opposed to a radical new theory ostensibly intended to explain the development of life through the agency of secondary laws.

Antagonism to 'the development hypothesis' did not extend to all sections of the social élite in Melbourne however. There were those who believed that evolutionary theory was a liberating intellectual idea that posed no threat to true religion or to man's supremacy in the animal kingdom. Further, the ethical implications of the theory that the *Age* found so disquieting could be interpreted in a manner which supported the opponents of political liberalism and economic protectionism. Even the natural theology that lay at the base of the prevailing social philosophy could be preserved; recent scholarship has indeed shown that the emergence of evolutionary theory did not destroy

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25 Sayers, op.cit, note 24, 260.


27 Sayers, op.cit, note 24, chapters 7 & 8,
traditional natural theology but transformed it, or rather, as one commentator has said 'was a subtle accommodation' within it.\(^{28}\)

When the *Argus* came out in support of Huxley it provided a powerful vehicle for those taking a more sympathetic view of the idea of human evolution to convey their message to a wider audience. The *Argus* was less explicit than the *Age* in identifying its social philosophy with scientific speculation; initially at least, it was Halford's style and rhetoric that it objected to. The allusion to the Devil it saw as 'vulgar claptrap' and 'imbecile scurrility', designed to imply that Huxley had written with 'a deliberate evil purpose in mind'. If Huxley was guilty of error, then it was scientific error, to be dealt with by recourse to the methods and data of science.\(^{29}\) Like the *Age*, the *Argus* thought that Huxley's investigations were a legitimate area for scientific enquiry and it condemned Cairns for becoming involved in a dispute that was 'purely scientific ... its rights and its wrongs must be proved in a rational manner without any reference to anything but the facts'. Reversing the argument spelt out by the *Age*, it warned of the dangers to science if theology was allowed to get involved in scientific investigation. What would have happened if the theologians had had their way with the geologist Charles Lyell thirty years before? The *Argus* had no doubt, reminding its readers of the fate of Bruno and Galileo.\(^{30}\) While joining the *Age* in believing that it was the 'spiritual and intellectual' abilities of man that guaranteed his supremacy over the ape, the *Argus* felt that Halford had misunderstood Huxley's position which was that 'there is less difference between Man and gorilla than between the gorilla and the lower kinds of monkey and therefore Man has no right to abrogate to himself an exclusive place in the scale of creation'. Halford's continual attempts to show that there was no identity of structure between the foot of man and ape was, according to the paper, therefore pointless.\(^{31}\)

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29 *Argus*, 20 July, 1863.

30 *Argus*, 3 August, 1863.

31 Ibid.
A number of factors were involved in determining the Argus's pro-Huxley position. Its attitude to the medical profession in Melbourne was often hostile, and it appears to have aligned itself to a prominent anti-Halford clique prior to the eruption of this particular dispute. The official journal of the local medical society felt moved on more than one occasion to complain against the paper's attitude. But probably of greater importance was the rivalry between the two newspapers on virtually every issue, especially when related to free trade and protectionism. It seems likely that, once the dispute was up and running, this traditional rivalry came into play.

Mention has been made of Edward Wilson's admiration of Darwin and the extent to which he rendered assistance in obtaining Australian material for inclusion in *The Expression of the Emotions*. On his return to Britain for health reasons in 1864 Wilson became a close neighbour of the Darwin family in Kent. It is unlikely that Wilson played a direct role in the Halford dispute because he no longer had input into the editorial policy of the newspaper; indeed, he appears to have been in conflict with the views of some of his editors on a number of issues. It does seem however, that the general thrust of the Argus's policy on social and economic matters was a strong determining factor in its pro-Huxley stance a point reinforced by its employment of the polymath professor, William Edward Hearn, to write feature articles on law and economics. Hearn's own social-evolutionary ideas were published in the same year as this dispute began (see Chapter 5).

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32 *Australian Medical Journal*, vol.8, 1863, 135; vol.9, 1864, 244-47, 347-49.


OPPOSITION TO HALFORD

In a small colonial community like that of Melbourne in the 1860s, opposing philosophies could hardly be seen entirely as abstractions: supporters and opponents of any position, on any subject, were likely to be known by sight and name, a factor which adds a personal edge to this dispute. Halford's opponents in Melbourne provide a good example of this.

The main opposition to Halford came from a group organized around William Thomson, one of the few medical men in nineteenth-century Melbourne to achieve anything like an international reputation. Thomson had played some part in the creation of the medical school but soon after Halford's arrival in December 1862, was highly critical of aspects of the proposed medical course. Described by one biographer as 'vain and irascible', he now crossed swords a second time with the new professor, and though the majority of his medical colleagues either supported Halford or maintained public silence, Thomson was not without allies in this affair from other areas of science. The most prominent of these was a chemist with the Geological Survey of Victoria, Charles Woods. Woods had studied under Huxley at the School of Mines in London prior to emigrating to New Zealand. There he had worked under James Hector, another Huxley protege, on the New Zealand Geological Survey before declining health forced him to move to Victoria. Woods was instrumental in eliciting the only public responses from Huxley to Halford's charges but, beyond that remained behind the scenes, apparently for fear of the likely repercussions on his career. Somewhat surprisingly, perhaps, he was on cordial terms with Halford's chief scientific ally, Frederick McCoy. McCoy was deeply interested in the work of the Geological Survey and maintained good relations with both Woods and Alfred Selwyn, Director of the Survey and another Huxley supporter. When Charles Aplin, a surveyor with the Survey, spoke up in favour of Huxley at one of Halford's public lectures, he ensured that the colonial geologists as a


37 Ibid. 272.

38 An obituary of Woods can be found in the Medical & Surgical Review, 7 May, 1864, 48.
body were seen as being in the front line of pro-evolutionists in Victoria. Why they should have been is unclear, but it does accord well with recent studies suggesting that Geological Surveys were among the first scientific institutions to take up the Darwinian theory. 39

The antagonism shown towards Huxley by the colonial medical profession remains problematic. Thomson's view was that it stemmed from professional jealousy (presumably aimed at Thomson himself) and a fear of falling out of favour with 'the prevailing disposers of patronage' at the University. 40 As his own career prospects at the University disappeared, at least in part, through this dispute with Halford, the claim cannot be dismissed lightly. 41 However, there are no convincing reasons for doubting that many Halford supporters were genuine in their statements rejecting the evolutionary point of view. A letter to the Argus signed 'Medicus' was highly critical of Thomson, and drew on Richard Owen's writings in support of Halford while at the same time emphasizing that it was the 'moral tendency' of Huxley's book that was the target of Halford's allusion to the Devil, not the nature of the investigation itself. 'Medicus' invoked the same natural theology as Halford when telling Thomson that he should examine all the facts of the case 'before sitting in judgement upon the works of the Creator', thereby inadvertently encapsulating in a few lines the wider context of the debate about evolution, and pointing up the incommensurability of the positions taken by the opposing sides. 42

Thomson's defence of Huxley came in the form of a critique of Halford's anatomical dissections. Writing in the Argus under the pseudonym 'Opifer', he rejected Halford's claim that the transversalis pedis was missing from the hind limb of the gorilla and chimpanzee. Further, he charged Halford with failing to recognize that the so called extensor metacarpi muscle in the ape was in fact the


40 Thomson to Huxley, 26 November, 1863; Huxley Papers, Imperial College of Science and Technology Archives, London.

41 Bryan Gandevia, op.cit, note 36, 271.

42 Argus, 20 July, 1863.
homologue of the *tibialis anticus* in man. This last point provides a good illustration of the difficulties involved in taxonomic argument, one that also lay at the centre of the case with Fitzgerald and the Australian orchids, and it is difficult now to decide how legitimate the respective positions were. A biographer of Thomson has described his criticisms as 'informed', and they were the basis of later attacks on Halford from sections of the British medical press, most notably the *Lancet* and the *Medical & Surgical Review*. Huxley accepted Thomson's interpretation, and a writer in the British scientific journal, the *Reader*, believed that Thomson had got the better of the argument. On the other hand, one of Halford's successors in the medical school has described the *Lancet*'s criticism as 'hostile and none too fair'. Empirical enquiry could not settle the matter then or now, for in essence the argument at the scientific level can only be understood within the context of taxonomies shaped by fundamentally different views of the natural world.

Taxonomic systems are now recognized to be conventional and dependent on data always open to alternative interpretation. Thus when Thomson accused Halford of 'breaching the doctrine accepted by all competent naturalists' known as the "unity of type" in claiming that the extensor metacarpi was present in the hind limb of the ape, he was doing so from a standpoint that assumed a particular evolutionary explanation for that doctrine. In short he was assuming, as indeed Darwin had, that closely allied species shared a common ancestry and therefore shared a common anatomical structure.

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43 *Argus*, 17 July, 1863.

44 Bryan Gandevia, op cit, note 36, 271; *Lancet* 12 December, 1863, 681-83; *Medical Times & Gazette*, 5 December, 1863, 596. The *Reader* article, dated 28 November, 1863, was reproduced in *Argus* on 19 February, 1864.


However, at face value, the doctrine was little more than an observation statement based on the common experience of naturalists, and explanations for it - or, more accurately, interpretations of it - were dependent on a naturalist's theoretical, philosophical or even metaphysical convictions. When Halford concluded his first publication with the claim that 'Surely the intricacies of the monkey's foot was planned, as was the comparative simplicity of man's! They could never run the one into the other, or to use a fashionably scientific term be developed the one from the other', he was in fact proposing an alternative view of the unity of type, one based on the time-honoured tenets of natural theology.48

Perhaps this aspect of the dispute can be better illustrated by looking at a not unrelated example from England. In 1873, the Catholic non-Darwinian evolutionist, St. George Jackson Mivart, published a response to Huxley's book in which, after comprehensively analysing the comparative anatomy of the entire primate order, he claimed that there was no single group of morphological characters that allowed an investigator to place any two (or more) species closer together than they were to any other. By ignoring Huxley's division of the anatomical characters into 'primary' and 'secondary' he was able to offer an alternative explanation, or at least, a refutation of Huxley's.49 Mivart's attack on Huxley's position has been echoed by others in this century, most notably perhaps by the neo-Lamarckian Frederic Wood Jones.50

Much of the scientific content of the dispute described here provoked a similar multiplicity of possible, usually incommensurable, positions. To account for the apparent 'supererogation' of nature in providing the ape with both a tibialis anticus muscle and Halford's extensor metacarpi (which was one way in which Halford supporters suggested that his findings could be reconciled with Thomson's critique), a writer in the Argus appealed to Owen's 'law of vegetative or

48 Halford, op.cit, note 11, 16.


irrelative repetition of parts'.51 Owen's highly confusing definition of this law proposed that it could account for 'the numerous instances in the animal kingdom, of a principle of structure prevalent throughout the vegetable kingdom exemplified by the multiplication of organs in one animal performing the same function'.52 Thomson commented acidly that the claim was 'nothing more than evidence that there were still men around who reject the great law of homology'. But, as in the case of the 'unity of type', the law of homology was open to a variety of interpretations, each dependent on a host of prior commitments. Far from the dispute being settled by 'an appeal to facts' as called for by the Argus, it had become increasingly bogged down in confusion stemming from incommensurable philosophical positions.53

When Halford published his first pamphlet on the dispute, the response was mixed. Entitled Not like Man, Bimanous and Biped, Nor yet Quadrumanous but Cheiropodous, it comprised sixteen pages of text and four plates prepared by two of his students, one of whom, James Edward Neild, was then editor of the Australian Medical Journal.54 Not surprisingly, the AMJ reviewed the pamphlet favourably, Neild almost certainly being the reviewer. Reaction to the work in Britain, however, was extremely unfavourable. The Lancet, drawing heavily on Thomson's writings, criticised both Halford's findings and the intemperate style of his attack on Huxley. The Medical Times and Gazette was rather more restrained in its treatment of Halford, but clearly preferred Huxley's position.55

HUXLEY'S RESPONSE

Woods kept Huxley abreast of events in Melbourne, and in February 1864 the colonial pro-evolutionary group received a boost when Huxley

51 Argus, 20 July, 1863.


53 Argus, 3 August, 1863.

54 George Britton Halford, op.cit, note 11.

55 Australian Medical Journal, October, 1863, 307-12; Lancet, 12 December,1863, 681-83; Medical Times & Gazette, 5 December, 1863, 596.
responded to Halford with a point-by-point rebuttal of his major criticisms. According to Woods, this was 'a real floorer for Halford', causing a 'sensation' in the medical school where (unnamed) Huxley supporters urged that it be published.\(^56\) In a letter to Alfred Selwyn, Huxley consented to publication, and Woods passed the article to Thomson who promptly sent it to the *Argus* where it appeared on 4 February 1864.\(^57\) There was little new in the piece, Huxley merely reiterating what Thomson had already reported and his reasons for eliminating 'variable structures' from the discussion. In replying Halford appealed again to those very structures as valid taxonomic markers.\(^58\) Three weeks later, Halford published his second pamphlet. Entitled *Lines of Demarcation between Man, Gorilla and Macaque*, it was designed to counteract a paper Thomson had delivered to the Medical Society of Victoria. Thomson's paper appeared in the Society's Journal for February 1864 under the title *The Transversalis Pedis, in the Foot of the Gorilla*, and in it he drew on the researches of Isidore Geoffroy St. Hilaire in asserting that the muscular form and structure of the gorilla's hind limb clearly suggested that it terminated in a true foot, although modified to suit the specific lifestyle of the creature.\(^59\) Halford himself then called on expert witnesses, including Owen, Duvernay and, confusingly, Geoffroy St. Hilaire, when tabulating evidence in his pamphlet in a manner favourable to his own position.\(^60\)

The AMJ was again impressed, but the British journals remained unmoved, the *Lancet* suggesting that Halford's experience of primate anatomy was inadequate to allow him to be seen as an expert on the subject. The *Lancet* did, however, make an important concession when it pointed out that in the final analysis the division of organisms

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\(^56\) Woods to James Hector, 9 August, 1863; Wellington Museum Records, New Zealand, Old Colonial Laboratories Box Files.

\(^57\) Huxley's letter to Selwyn has not been sighted; its existence is known only from a comment in Woods' second letter to Huxley, dated 24 February, 1864, Huxley Papers, Imperial College of Science and Technology Archives, London.

\(^58\) *Argus*, 6 February, 1864.

\(^59\) Thomson sent a copy of this paper to Huxley, see letter from Thomson to Huxley, note 40.

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58 Argus, 6 February, 1864.

59 Thomson sent a copy of this paper to Huxley, see letter from Thomson to Huxley, note 40.

60 George Britton Halford, Lines of Demarcation between Man, Gorilla and Macaque, (Melbourne: Wilson & Mackinnon, 1864).
into orders, sub-orders, classes and so on was largely dependent on the weight allotted by particular naturalists to the classificatory value of certain characters. This is precisely the issue evident in the argument between 'Medicus' and Thomson discussed above.61

The publication of these pamphlets produced different reactions, and had widely different effects on Halford's reputation, in Australia and Britain. In Melbourne they increased his public profile, and with the favourable response of the AMJ behind them, imbued their author with considerable public prestige. In Britain, however, they further damaged his reputation, which had already been tarnished following the report of a clash between himself and Thomson. It transpired that after his first lecture, and in response to Thomson's initial attack, Halford had placed his macaque dissections on public display at the University. Thomson, along with James Keene, the editor of Melbourne's second medical journal, the pro-Huxley Medical and Surgical Review, attended. When Halford discovered that Thomson was 'Opifer', a heated argument ensued which ended with Halford, brandishing a scalpel, hustling Thomson into the street. Thomson promptly published an account of the incident in the Argus and Keene did likewise in the Medical and Surgical Review.62 One of these accounts (probably Thomson's) found its way to Britain where it appeared in a garbled form in the Medical Times & Gazette, which severely rebuked Halford for his behaviour.63 This report could have done little for Halford's aspirations for international recognition later in his career, but before discussing that aspect of the affair, the last act in the saga needs to be considered.

ENTER THE GORILLAS
The pro-Huxley forces suffered a setback in May 1864 when Woods died of tuberculosis.64 The dispute then disappeared from view for over a year, but re-emerged in June, 1865, when McCoy announced in the

61 Lancet, 18 June, 1864, 700-1.

62 Argus, 22 July, 1863; Medical & Surgical Review, July, 1863. I have only seen the portion of this latter report reprinted in the Argus.

63 Medical Times & Gazette, 3 October, 1863, 362.

64 See note 38.
Argus that he had procured a group of stuffed gorillas from the explorer Paul du Chaillu, the first time these creatures had appeared in the colony. McCoy urged his fellow citizens to view this group at the Museum so as to judge for themselves 'how infinitely remote the creature is from humanity, and how monstrously writers have exaggerated the points of resemblance when endeavouring to show that man is only one phase of the gradual transmutation of animals; which they assume may be brought about by external influences and which they rashly assert is proved by the intermediary character of the gorilla between the other quadrumana and man'.

Public interest in the dispute revived: the following week, attendance at the Museum more than doubled. Halford gained access to this new material and encouraged a student, Patrick Moloney, to submit a short paper to the AMJ intended to support the 'cheiropodous' nature of the gorilla. The attempt was too enthusiastic, however, and a month later another of Halford's students, William Carey Rees, wrote to the journal pointing out that Moloney's claim that the gorilla was 'four-handed' put him at odds with the professor, who had merely designated it as 'finger-footed'. Halford re-entered the dispute in his own right in July with a lecture to the Royal Society of Victoria in which he once again urged his audience to accept the anatomical evidence in favour of his position. The discussion that followed became animated, with Charles Aplin of the Geological Survey defending Huxley against an audience that was overwhelmingly in favour of Halford. The broad boundaries of the dispute once again surfaced when McCoy claimed that through Halford's investigations 'the world could now rest easy, free from any belief that the passage between Man and the inferior mammals was to be bridged over by a creature like the gorilla'. Huxley's book was 'a swindle' according to the president of the Society, the Reverend John Bleasdale, who now added a Roman Catholic voice to that of the

65 Argus, 20 June, 1865.
66 Argus, 28 June, 1865.
Presbyterian Cairns. Bleasdale left no doubt as to whom the 'credulous' readers of the book earlier referred to by the Age might be when he claimed that Huxley's reasoning was 'suited only to the half-educated intellect fashioned in Mechanics Institutes'. Halford, abandoning his reformed tone, called the book 'disingenuous' and 'calculated to mislead the class of persons to whom it was addressed'.

Thus two years of argument had not moved the issue forward, each revival of interest simply emphasizing the extent to which the dispute was bound up with the wider context of the debate about evolution.

THE REPERCUSSIONS

It was suggested earlier that Halford's reputation suffered in Britain as a result of his involvement in this dispute. The evidence for this claim emerges from examination of his attempts to gain recognition for his work from his British counterparts. These attempts were made at a time when British science was undergoing major changes, and it would appear that Halford was left behind in those changes. In 1867, Halford wrote to Richard Owen seeking advice on the procedures to be followed in applying for fellowship of the Royal Society of London. To support his claim he cited two areas of his scientific work, his investigations into the physiology of the heart, carried out prior to his appointment to the Melbourne chair, and his research into a cure for snake-bite through injection of ammonia. Perhaps in recognition of the antagonisms it had aroused in Britain, he avoided mentioning his dispute with Huxley, who along with John Tyndall and others of the 'scientific naturalism' school, was rapidly becoming a major power-broker in British science. Increasingly, scientific institutions were being moulded in the interests of this group, who were taking control of professional appointments and setting the agenda for science policy. As a consequence, scientists identified with the older school of British natural theology were being rapidly frozen out from appointments and power. In retrospect, Huxley's reference to Halford in his 1864 letter to Woods as 'your eccentric professor of medicine at the University of Melbourne' has an


70 Halford to Owen, 22 September, 1867; Owen Papers, British Museum (Natural History).
ominous ring. Halford's desire to become an FRS was never realised, and his career became entirely bound up with the Melbourne medical school.

Some of his supporters fared better, illustrating the distinction between being rewarded for endeavour and being shut out for 'political' misjudgment. Frederick McCoy was elected FRS in 1880, the reward for decades of diligent correspondence with major British scientists such as the geologists Adam Sedgwick and Roderick Murchinson. McCoy was generous in exchanging geological and zoological material with overseas museums, and his control of the colonial museum kept him within the imperial network of science. It was another 'network' scientist, the government botanist Ferdinand von Mueller, who canvassed support for McCoy's FRS application. Years of correspondence with William and Joseph Hooker at Kew Gardens and collaboration with George Bentham on the Flora Australiensis gave Mueller access to the new scientific power-brokers in Britain. He wrote to both Huxley and John Lubbock seeking their support for McCoy's candidature as FRS, temporarily at least overcoming his distaste for the Darwinian doctrines that both enthusiastically espoused; indeed, when his own position at the Botanical Gardens was under attack he even wrote to Darwin seeking support. While both McCoy and Mueller spoke out publicly against 'the theories of Darwin and Vestiges', neither engaged in the type of head-on controversy undertaken by Halford, and

71 Huxley to Woods, op.cit. note 56.

72 K.F. Russell, The Melbourne Medical School, 1862-1962, (Melbourne: Melbourne University Press, 1977). In 1869 Halford's name was put forward for the fellowship, his application being supported by Richard Owen and James Paget among others. These two had been his original supporters for the Melbourne professorship. I should like to thank Professor Rod Home for providing me with this information.


74 For Mueller's career see Margaret Willis, By Their Fruits: A Life of Ferdinand von Mueller, Botanist and Explorer, (Melbourne: Angus & Robertson, 1949). The letter to Darwin is dated 10 June 1874, DAR 171, Cambridge University Manuscript Room.
both made solid, if unspectacular, contributions to colonial and international science.75

CONCLUSION
In this chapter I have sought to show how an apparently trivial argument about comparative anatomy can be seen as a major debate when connected with the complex question of 'man's place in nature'. By unravelling some of the major components of the debate, it has been possible to show how social, religious and philosophical factors play a role in 'scientific' controversy. Further, it has been suggested that evolutionary theory was perceived as a threat by some sections of Melbourne's social and intellectual élites, while in contrast, other sections were happy to welcome evolutionary theory in the belief that it could be used to reinterpret and validate ideas in social, religious and political spheres.

The colonial background to this particular debate allows us to witness the fluctuating fortunes of individual careers. Halford was successful in achieving a high degree of prominence within Melbourne public life, and this success was not dependent on the correctness of his position, either in this instance or in his work on an ammonium treatment for snakebite, which also became the subject of public controversy, but rather on his ability to initiate and sustain a public debate on a crucial scientific issue for over two years. In defending a position that had broad support from social and intellectual élites within the Colony, Halford was guaranteeing his place as a prominent spokesman for science in Melbourne. However, the rapidly changing power structure in British science in the years following the publication of the *Origin of Species* was important among the factors that led to his failure to achieve the international scientific honours he sought.

When placed in this wider social and cultural context and seen as part of the debate on man's place in nature, the dispute between Thomas Henry Huxley and George Britton Halford cannot be dismissed, as one commentator on the affair has suggested, as 'a trifling argument on comparative anatomy'.76

75 Ann Moyal, op.cit, note 72.

CHAPTER 4

LIFE, MAN AND MATERIALISM; THEOLOGY AND SCIENCE IN THE EARLY RESPONSES TO DARWINISM

The dispute between Halford and Huxley over man's place in nature had repercussions at both the local level and to some extent internationally affecting individual careers and highlighting local tensions among the intelligentsia of Melbourne. It also brought into focus differing attitudes to science and the aims and objectives of science. While the 'Paley versus Darwin' scenario is obviously too crude to allow for a fine-texture analysis, it does serve to illustrate the two ends of the spectrum of opinion among Australian scientists and churchmen on the questions of evolutionary theory in general and man's place in nature more particularly. Those debates set the general discussion on the merits of Darwinism into the wider context where religious, philosophical and social factors were constantly in play, but other publicly aired debates broadened the base on which the same factors could be observed operating. These often centred around the claims of science to be an arbiter of knowledge in areas which traditionally had been seen as the preserve of religion. Where was the line to be drawn between the theological and the scientific? Were there areas of knowledge where science must remain silent, or where it had no right to trespass? Closely tied to these questions was the issue of who was to know? To whom was knowledge to be entrusted?

For those colonial participants who understood the controversies over Darwinism in a broader social context this last point was perceived as having serious ramifications. There is nothing to suggest a clear distinction between political liberals and conservatives in the acceptance or rejection of evolutionary theory, but there is some evidence favouring the view that a mixture of social, religious and philosophical commitments might determine the extent to which individuals or groups took sides on the matter. Passions were likely to be inflamed more from the implications that could be drawn from the application of Darwinian theory than from the theory itself. The implications might in turn relate to religious, political or scientific concerns, but invariably these were so intermingled as to be all but
impossible to unravel. The material that follows serves to illustrate this last point.

PROVIDENCE AND DARWINIAN THEORY

Given that, as Ann Moyal has pointed out, for most of the colonial intelligentsia some form of providentialism still held sway in their understanding of the natural world and the role of man in it, then it is not surprising to find a variety of generally hostile responses to the naturalistic explanatory base that was usually assumed to underpin the Darwinian theory. The need for a personal creator and the belief in a world which evidenced his activities remained a key issue for most colonial scientists well into the second half of the nineteenth-century. As a result some of the more prominent scientists took the opportunity to oppose 'the development hypothesis' at every turn, publicly through lectures, institutionally through their roles as teachers, privately through correspondence.

This opposition took on extra meaning when some of the chief spokesmen for religious and political institutions joined with their scientific colleagues in opposing Darwinism. Invariably the topic of man's place in nature provided the catalyst for debate, but this has to be seen not in the narrower sense that a cursory study of the Halford and Huxley dispute might appear to exemplify but in the wider sense discussed in the Introduction. Even when something as far removed from the issue of man's relation to the apes as the 'physical basis of life' was being discussed it is clear that philosophical and religious concerns were central; indeed the involvement of so many prominent churchmen in the discussions proves the truth of this point.

In 1860 the Anglican Bishop of Melbourne, Charles Perry, lectured publicly on the topic 'Genesis and Geology'. Perry set out to show that modern geological theories could be reconciled with the Mosaic account of creation. While some reinterpretation of the terminology of Genesis was called for, especially where the length of the days of creation was concerned, this was not problematic for Perry who saw as the real issue the remarkable parallel between the sequence of creation as set out in the Biblical account and recent discoveries in

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geology relating especially to the succession of life on earth. So accurate did the Genesis account appear to Perry that given the lack of geological knowledge available to its human author there was only one explanation for it and that was divine revelation. The parameters Perry set out for grappling with the relationship between science and religion remained virtually unchanged through all his later public utterances on the subject when both Darwin and Huxley came in for considerable criticism. For Perry, it was not necessary that there be detailed identity of agreement between scripture and science, only a correspondence along broad lines.²

Privately many scientists expressed their opinions on the relationship between Darwinism and religious belief. Writing to the politician Robert Lowe in 1860, the Sydney naturalist William Sharp Macleay reduced the issue to the question 'what is man, a created being under the direct government of his creator or only an accidental sprout of some primordial type that was the common progenitor of both plants and animals?'³ Macleay was a man with excellent scientific credentials; his own extremely complex quinarian system of classification was much discussed by some of the prominent naturalists of the day, including Louis Agassiz. Darwin himself appears to have flirted with it in the earliest stages of his investigations into the species problem.⁴ When the question of man's place in nature became a publicly discussed issue in 1863, Macleay let it be known that he accepted the close physical relationship of man and ape but rejected the possibility of there being any intellectual evolution connecting the two groups. Rejecting Darwinism, Macleay opted instead for a divinely ordained universe where 'even the black tuft of hair on the breast of the turkey cock' was evidence of providential concern. Macleay railed against those who sought to 'surrender everything to the many headed monster' of democracy and the rush to embrace 'the brutality of the mob'.⁵ This

² Perry's lecture is reported extensively in the Age, 28 September, 1860.


juxtaposition of political and scientific candour illustrates again the strength of Robert Young's claim that there is no point at which scientific content can be isolated out of the debates over Darwinism; social, religious, economic and philosophical factors always provided the common context for those debates. When a colonial churchman described Huxley's reasoning as a 'swindle ... fit only for the half educated intellect fashioned in mechanics institutes' there is an obvious element of religious outrage involved; when that same churchman was also a President of the local Royal Society there was every likelihood that something more was also at stake.

A similar situation obtained when eminent social figures spoke out on scientific issues. Halford had received support from the highest possible sources when lecturing publicly, most notably from the Governor of Victoria, Henry Barkly. In 1860 and 1861 Barkly was President of the Royal Society of Victoria, a role which almost by tradition required him to address the scientific elite of the colony on the general state of science and the scientific advances made in the previous year. His 1860 address came before the Darwinian issue emerged into prominence; it was in essence a plea for scientific freedom as a religious duty; scientists ought to be free to investigate all aspects of the natural world as a counter to religious scepticism. A year later, Barkly was warning against the 'gross and subversive theory of progressive development'. Politically, Barkly was grappling with the social turmoil arising in the aftermath of the gold rushes in Victoria; in seven years as Governor (1856-1863) he witnessed six changes of government and the encroachment of that 'many headed monster' that so disturbed Macleay.

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5 Macleay to W.B.Clarke, 27 June 1863, Clarke Papers, Mitchell Library MSS 139/11.


7 See the previous chapter. The speaker was the Reverend John Bleasdale. His comments came at the conclusion of Halford's lecture on the gorilla at the Royal Society of Victoria and were reported in the Argus, 25 July, 1865.

8 Henry Barkly, Presidential Address to the Royal Society of Victoria, Transactions of the Royal Society of Victoria, volume 5, 1860, 12.

9 Henry Barkly, Presidential Address to the Royal Society of Victoria, Transactions of the Royal Society of Victoria, volume 6, 1861, xix - xxxiv
Publicly he expressed concern at the possible breakdown of social relations between labour and capital and the collapse into anarchy that would inevitably follow. Against such a background, a scientific theory which in the minds of its critics threatened established religious values and institutions must have appeared doubly subversive, undermining both individual morality and class and social stability.

There was less overt concern for the social consequences of Darwinism in the attack on Darwin launched by Barkly's gubernatorial counterpart in New South Wales, William Denison, but the thrust of his comments made it clear that he perceived the same dangers to the socio-political system. Like many anti-Darwinians, Denison probably never read Darwin, and he based his criticism on a hostile review of the Origin of Species in the British Quarterly Review and a series of lectures given by Simon Pittard, Curator of the Australian Museum in Sydney and a protégé of Richard Owen. Again like many colonial anti-Darwinians, Denison believed that there was nothing original in the Origin, and he placed it in the same category as Lamarck's work and Vestiges of Creation.

Frederick McCoy, Pittard's opposite number as Director of the National Museum of Victoria, used Adam Sedgwick's massive critique of Vestiges, appended to later editions of his Discourse on the University, as the basis for his own attacks on 'the development hypothesis'. McCoy was a former co-worker with Sedgwick in Britain and his position at the Museum along with his Chair of Natural Science at the University of Melbourne gave him a prominent place in Victorian scientific circles. He used it to good effect for the anti-Darwinian cause, giving two long lectures to the Early Closing Association on 'The Order and Plan of Creation' in 1869 and 1870. Besides Sedgwick, McCoy drew on the ideas of the Swiss-American naturalist Louis Agassiz, who had proposed that the flora and fauna of the world could be divided into six zoological provinces in the northern and southern hemisphere. Each of these provinces had its own autochthonous life-forms which had been created for the particular conditions existent at the time, but there was


no suggestion that physical conditions such as climate actually
determined the type of flora or fauna. Similarities between groups of
animals and plants that were often geographically distant were
explained not according to any genetic relationship but as the working
out of a divine plan. Discussing the idea of such 'centres of creation'
years later, McCoy used the examples of the Ostrich, Rhea and Emu to
show that similarity of form and habit could not be assumed to mean
common ancestry, for, 'there could be no question of one of these forms
having grown out of the other by a difference of surroundings for the
Ostrich has two toes, and the Australian and South American forms
three - a change not required, and all three thriving when introduced
into any one of the localities by man'.

Agassiz was a Unitarian in
religion, but McCoy, an Anglican, found no difficulty in using the
argument for 'centres of creation' in presenting his lectures which took
the first two chapters of Genesis as the framework for discussing the
order of creation from physics to biology. Like Perry, McCoy was happy
to allow the days of creation listed in Scripture to be of an indeterminate
length; the main thing was to assure the faithful that there was general
agreement between the scientific and religious accounts and no grounds
for believing in a materialist interpretation of the origin and
development of life.

McCoy claimed in later years that he had attempted to
organise the National Museum of Victoria along lines that illustrated
the views he put forward in these lectures; he felt that a museum ought
not to be simply a building stuffed with specimens but should display the
interrelationships of the animal and plant kingdoms, which a proper
study of the geographical distribution of lifeforms uncovered.
Continuing problems with funding ensured that this enlightened
program of museum management failed to materialise.

As a teacher, McCoy showed the same negative attitude to
evolutionary theory that he displayed in his public lectures. William

12 Frederick McCoy, 'The Order and Plan of Creation - The Substance of Two
Lectures Delivered before the Early Closing Association, 1869-1870' reprinted in
Lectures Delivered before the Early Closing Association, Melbourne, 1869-70,
(Melbourne: Samuel Mullen,1870). For the views of Agassiz and Sedgwick see Adrian
Desmond, Archetypes and Ancestors: Palaeontology in Victorian London 1850-1875,

13 McCoy Papers, (v). National Museum of Victoria. This reference was first pointed
out to me by Professor Sally Kohlstedt.
Sutherland, later to become Australia's first world-renowned physicist, attended McCoy's lectures as a student in the 1870's and was annoyed to hear him 'thunder against the Darwinian doctrine'. Examination papers for McCoy's courses invariably included questions aimed at forcing students to criticise evolutionary theory and one biographer claimed that 'students who incorporated the results of independent reading on evolution in their examination papers did so at their own risk'. Theoretical biology seems to have taken a back seat for most of McCoy's period at the University and there is little evidence that he kept himself abreast of developments in the field. His lectures remained almost unchanged during the three decades in which he taught, and it was a common belief that lecture notes were 'handed down from father to son, with the jokes underlined in red ink'. The effect of such an apparently outmoded attitude to new scientific ideas ought to have been wholly negative, but Sutherland reported ruefully that McCoy was likely to turn out more believers in evolution than the 'enthusiastic Darwinite' Ray Lankester, whose lectures Sutherland attended on taking up a scholarship at University College in London in 1879. Whereas Lankester was 'too slavish' in his 'devotion to Huxley' and spent too much time going into detail 'with the anatomy of a very limited number of animals', McCoy, beginning as always with the first chapter of Genesis, 'had taken a broad survey of comparative anatomy, beginning with the lowest types and working up to man'.

McCoy's opposition to Darwinism stemmed from a combination of religious conviction and loyalty to former teachers and colleagues. Ferdinand Mueller, Director of the Melbourne Botanical Gardens and a committed Lutheran, certainly rejected evolutionary theory on religious grounds, but probably had other reasons as well.

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16 Ibid. 18.

17 W. A. Osborne, op.cit, note 14, 30-31.

18 For Mueller's life and work see Margaret Willis, By Their Fruits: A Life of Ferdinand von Mueller, (Sydney: Angus & Robertson, 1949).
Much of his work involved collecting and classifying plant specimens, and his view of the scientific enterprise seems to have been almost entirely Baconian, using Susan Faye Cannon's loose but useful definition of that term as it was used in the nineteenth-century as being something like the collection of facts, lots of facts, in all sorts of places, and on queer applied subjects; the absence of any analytical theory or of sophisticated mathematical tools; the belief that a hypothesis will emerge somehow from the accumulation of facts...it means an activity very suitable for a new country where collecting new rocks and species is easy.\textsuperscript{19}

Mueller was not alone in Australia in taking such an attitude to the scientific enterprise, as much of what follows in this chapter makes clear. He was, however, probably the most celebrated. Well into the last decade of the century, Mueller was warning against the tendency to theorise on insufficient grounds (see Chapter 9). His firm belief that it was always possible to distinguish species from varieties and that species had a real existence in nature led him into some major areas of controversy with George Bentham, the Darwinian leaning author of the Flora Australiana. Mueller was Bentham's chief source of information on Australian botany. In contrast, his extensive correspondence with Darwin's closest scientific confre Joseph Hooker at Kew Gardens seems to have lacked any disputatious element relating to evolutionary theory.

While the public scientific response to Darwinism was generally negative, among the non-scientific sections of the educated public there was often a more positive tone. Henry Gyles Turner, later to become a prominent banker and historian in Victoria, read the Origin of Species in 1862. While admitting that his grasp of the scientific details was flimsy, Turner found the logical structure of the book impressive and felt that the number of disparate facts in natural history that it pulled together was a strong point in its favour. He quoted an unnamed friend 'with scientific credentials' who described natural selection as 'the imperfect working of natural law ... the means are cumbersome, cruel and but shiftily adapted to the end, and are [sic] scarcely able to bring your mind to regard it as the work of omniscience'.\textsuperscript{20} Turner was

a Unitarian and a founding member of the Melbourne Eclectic
Association, a group dedicated to discussion of important questions of
the day in science, philosophy and religion from a free-thought
perspective. Later in life he read the German Darwinian, Ernst
Haeckel's work Monism; The Confession of Faith of a Man of Science,
describing it as 'a terrible book in its relentless logic ... [but] as far as I
can follow the argument the conclusions appear irresistible ...It would
be interesting to know how the world takes this outspoken deliverance,
which knocks away all the props that support the hope of a personal
immortality'. Turner was present on the occasion of a lecture by
Charles Perry in 1862, and took exception to the way in which the Bishop
in about an hour demolished to his hearts content Mr Darwin and his
time (and) turned to Sir Henry Barkly who was in the chair, and said
that being but an indifferent naturalist himself he had felt some
delicacy in lecturing on such a subject before one whose attainments in
that branch of science ranked so high! Not a word about his delicacy in
putting the opinion of an 'indifferent' naturalist against
unquestionably one of, if not the first naturalist of the age ... The
presumptions impertinence of the remark is only surpassed by its
profound snobbishness.22
Perry's lecture had a lasting effect on Turner; when he came to write
his two volume History of the Colony of Victoria in 1904 he painted the
Bishop as a man out of touch with modern thought, one who 'had so
little conception of the trend of scientific investigation as to be satisfied
that he had demolished Darwin and all his theories in the course of an
hour's lecture'. Turner's dismissal of Perry's criticism of Darwin was
quite astute, despite the fact that Perry had always been a keen follower
of scientific matters. For fifteen years prior to his arrival in Australia he
had worked alongside William Whewell at Cambridge. In 1833 he
attended the third meeting of the British Association for the
Advancement of Science, making the acquaintance of many prominent scientists including Thomas Chalmers, author of one of the Bridgewater Treatises. His own attitude to science was predicated on the sort of inductivism that underlay the providentialist approach to science along with the Baconianism described earlier. Perry was an evangelical, and his sympathy for science, albeit a science circumscribed within a narrow and increasingly outdated definition, was neither surprising nor contradictory. Indeed, recent findings suggest that evangelicals did not reject the scientific enterprise per se but only the attempt to formulate that enterprise in ways that made it inimicable to religious faith.

Turner's aversion to the ecclesiastical attack on Darwin was shared by many of the freethinking community of Melbourne. In the late 1860's two debates involving evolutionary theory and its wider implication occurred which, like the earlier Halded and Huxley controversy, echoed developments in Britain. The first of these again involved Huxley, centering around his work on protoplasm as the physical basis of life, while the second saw a public debate on that other great question relating to man, the antiquity of his lineage.

PROTOPLASM
In 1869 Huxley published in the Fortnightly Review an article entitled 'Protoplasm: The Physical Basis of Life'. There was nothing particularly original in the piece, the chief tenets of which had been a commonly discussed matter in scientific circles for more than twenty years. Controversy ensued however, centred on two key issues. In the first place, Huxley had originally presented the material in the article to an audience of working men, raising in some minds the spectre of an anti-


religious materialism becoming rife amongst an ill-educated social class. Secondly, while 'Protoplasm' contained no overt reference to Darwinism, it was commonly linked with 'the development hypothesis' in public debate, especially when the issue of the materialistic basis of both doctrines was raised.

Within months of the article being published in Britain it became widely available in Melbourne as a locally printed pamphlet. The public furore that followed became known in Britain via the pages of Nature, which under the headline 'The Protoplasm Excitement at the Antipodes', pilloried the intellectual condition of Australia and what it saw as the ignorant manner in which clergymen in particular were likely to attack scientific ideas which they showed little sign of understanding. While Nature believed that there were encouraging signs of Australia taking on its own 'national character' it was not so convinced that 'scientific zeal will be one of its chief features' for 'heavy land wants well turning up'. What particularly annoyed the journal was the trivialisation of the discussion, a point it illustrated for its readers by describing how one enterprising Melbourne restaurateur was lecturing on protoplasm each lunchtime while serving it up to his customers. More positively, if inaccurately, it commended Halford for defending Huxley in front of a hostile audience; reminding its readers of the earlier dispute between the two men it welcomed the admission by the 'talented anatomist' that 'he had seen reason to change his mind'.

To some extent Nature was inaccurate in its reporting of the situation at the Antipodes. Halford went to some lengths to point out that his support for Huxley on protoplasm did not imply that he had changed his mind about the question of man's supposed relationship to the ape. More generally, while there was a great deal of religious and philosophical ignorance displayed by many of the leading churchmen and non-scientific participants, the debate over protoplasm displayed some of the real complexities that lay behind so many of the arguments revolving around the general issue of Darwinism in its larger sense.

The argument often levelled against Huxley, that his discussion of the reality and properties of protoplasm implied an underlying commitment to a materialist philosophy of biology, had a

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certain validity. While the debate about man's place in nature was about descent, and relationships in time and space, that surrounding protoplasm concerned the common material basis for all life forms. As such it could be seen, and by many clearly was, as part of the programme to deny any privileged position to man in the animal kingdom. Huxley had rejected the idea that there was any place for a vitalistic life force, but confused his listeners and readers by denying that his support for a materialist substratum for life automatically provided support for proponents of a more general materialist philosophy. Beyond a certain level of analysis there were limits to scientific enquiry, and the nature of matter and of spirit were questions that fell outside of those limits, according to Huxley. Materialism as a philosophical system was untenable but in scientific enquiry materialistic terminology was 'in every way to be preferred'. In essence, Huxley was arguing for a materialist terminology as part of a wider program for creating a secularised science which ignored religious factors altogether. The ultimate goal was to bring about a complete separation between the competing epistemes of scientific explanation which Neil Gillespie has described as 'creationist' and 'positivist'.

Halford, surprisingly, agreed with Huxley on the desirability of finding 'a material substratum' for man's 'thoughts and acts', which he pointed out was also the opinion of Richard Owen, and represented 'the trend of modern thought'. His attempts to expound the matter further were foiled when the University Council, swayed by a motion from Charles Perry, used its statutory authority to veto what it claimed would be a lecture on a 'religious subject'. Perry may well have had good reason to be disturbed by the likelihood of Halford stirring up religious tensions. Despite his obvious Christian beliefs, Halford had been a founding member of the liberal and well named Eclectic Society,


30 Argus, 1 & 2 July, 1869.

31 Australian Medical Journal, August, 1869, 259, Argus, 31 July, 1869.
the existence of which had been the spur to the formation of the Early Closing Association. When the local press published an account of the University veto, a storm broke which had the ironic effect of uniting many members of both factions in the argument over Darwinism, against authoritarian censorship in scientific enquiry. What might have been a minor squabble at the edges of the wider debate about evolution took on a double identity with scientific freedom emerging as a hotly disputed issue, and the full range of pro-and anti-clerical factions finding their voice.

The University veto meant that Halford's only public statement on protoplasm was limited to the brief comment detailed above, made at the end of the first of two lectures delivered by the Reverend R.B. Higginson. Higginson had denounced 'the materialist theories of Darwin and Huxley, which by their nature oozed ludicrousness' and rejected as unproven Huxley's claim that protoplasm was the common basis of all life. Chemical investigation had shown that there were differences in the blood of man and the lower animals, and it seemed reasonable to suppose that further study would show similar distinctions in the nature of protoplasm. Notwithstanding Huxley's statement to the contrary, the rejection of vitalism left no alternative but materialism according to Higginson, and the attempt to distinguish terminological materialism from the materialism associated with Comte and his followers was therefore disingenuous.

Writing to the Argus prior to the veto of his proposed lecture, Halford quoted John Locke to the effect that the Christian belief in 'a future life and the resurrection of the dead, rests on the grounds of their being parts of a Divine revelation'. In this way he sought to draw a distinction between the truths of science that were based on reason and the application of accepted scientific methods, and those of revelation that were based on faith. Higginson accepted Halford's attempts to


33 Argus, 20 & 27 August, 1869.

34 Higginson first gave his lecture in June and repeated it after Henry Gyles Turner suggested a debate on the issue. See Argus, 7 & 11 June, 1869.

35 Argus, 2 July, 1869.
separate scientific questions from religious beliefs but pointed out that Huxley had made no such distinction in his lecture. At the conclusion of Higginson's second lecture Halford had urged that the clergy should stay out of scientific disputes, a suggestion the lecturer rejected on the grounds that Huxley's intention had been to deliberately undermine the religious faith of a largely uneducated social class (the workingmen he was addressing, presumably). In those circumstances he felt justified in coming to the defence of traditional Christian doctrine.

Charles Perry, successful in stopping one line of public discussion of the question, joined Higginson in believing that Huxley's paper carried a hidden agenda; the objective was 'not to teach science but to propagate infidelity' and 'root out those instinctive convictions of human nature which are the foundations of all religious belief'. Along with Vestiges and Darwin, Huxley was attempting 'to produce ... a disbelief in the Bible'.

Huxley's failure to spell out exactly what he saw as the nature of protoplasm left many readers feeling confused, and suspicious that the original lecture had been based on speculation and was more akin to mischief making than education. Was protoplasm life itself or merely the vehicle of life? McCoy accepted protoplasm as the fundamental constituent of all living things, but claimed that life was incapable of explanation in purely mechanistic terms; each plant and animal had life 'breathed into it by God', which suggested that protoplasm was nothing more than the 'dust' spoken of in Genesis as the building matter of life. The point was put more forcefully by John Bromby, Headmaster of the prestigious Melbourne Church of England Grammar School and himself a clergyman. Referring jocularly to 'that terrible Protoplasm' Bromby rebuked Huxley for calling it 'the clay of the potter' when the units of protoplasm are themselves living agents and are therefore not 'bricks and mortar' but 'intelligent hodmen, carrying materials here and there'. Not only had protoplasm an instinctual

36 Argus, 23 July, 1869.

37 Ibid.

38 Argus, 21 September, 1869. Perry's remarks were later incorporated into his published lecture entitled Science and the Bible, (Melbourne: Samuel Mullen, 1869).

39 Frederick McCoy, op.cit, note 12, 12 - 16.
element urging it to its various duties, but according to Bromby Darwin had shown it had the capacity to transform animal and plant life.40

A prominent Tasmanian naturalist, William Archer, wrote to Huxley directly, seeking clarification on a number of points. Archer pointed out that either protoplasm has life in itself and therefore can never die (by definition there can be no such thing as dead protoplasm) or it is merely lifeless matter to which vitality is imparted by some means yet unknown to science. If, as Archer believed, Huxley was arguing for a physico-chemical explanation for life, then there were difficulties, for 'as far as our senses can determine the point, there is no material difference whatever between the material condition of a living body and that of the same body after it's death, the only difference between the two is caused by the presence or absence of life - life imponderable, invisible and utterly beyond our ken'. Archer's request for clarification was genuine, couched in friendly terms and addressed to a man he admired for having the courage to undertake 'enlightened and independent researches'.41 A sound botanist, Archer was a correspondent of Joseph Hooker and a Fellow of the Linnaean Society of London; his 'deep sense of piety' seems not to have affected his search for answers to controversial questions, nor troubled him in terms of the religious and social consequences of some of the possible answers. The contrast with the more forceful Perry could not be more marked.42

PROTOPLASM AND THE NATURE OF SCIENCE

The protoplasm controversy once more raised the issue of the nature of science and the correct procedures to be followed in undertaking scientific investigation. In its older, providential form science was envisaged as complementing the truths of revelation. This was often equated with a simple Baconianism in which theory was subordinated to fact (and sometimes eschewed altogether). Critics of Darwin and


41 Archer to Huxley, 5 October, 1869, Huxley Papers, Imperial College, London.

42 G. T. S. Stilwell, 'William Archer' Australian Dictionary of Biography, volume 3, (Melbourne: Melbourne University Press, 1969), 40-41. This is not the same Archer mentioned in the previous chapter.
Huxley, convinced of the correctness of this procedure, had no trouble objecting to what they saw as a too-ready eagerness to speculate first and seek the corroborating factual data later. Higginson for example accused 'modern physiologists' of making bold theories 'with little or no proof and found no difficulty in relegating the ideas of Darwin and Huxley to the same level of scientific credibility as mesmerism and spiritism.43 Perry too, seems to have favoured the popular image of the Baconian attitude to science, defining it as 'the accumulation of all that man has been able to discover by the use of his unassisted reason concerning this visible world and concerning the events which have occurred and are occurring in it'. Perry distinguished between scientific hypotheses such as Newton's on the nature of light which, while wrong, were based on reasonable probability and those of Vestiges and Darwin which had no such probability. By what criteria the notion of reasonable probability was to be assessed, Perry did not make clear, saying only, that while Darwin's facts as given in the Origin of Species might be accepted, there was no obligation to accept the conclusions that the author drew from them.44

Much emphasis was given by critics of Darwinism and the Huxleyan interpretation of protoplasm to the demand for proof of the proposed theories. Perry seems to have believed that science was both self-correcting (false theories would be found out by further investigation) and a method of discovering and accumulating truths about the physical world. Thus true science was that which was able to prove in some strict sense that its propositions were true. Both Higginson and McCoy also criticised the lack of proof provided by Darwin and Huxley for 'the development hypothesis'.45

Supporters of the evolutionary cause in general, and the Huxleyan view of protoplasm in particular, tended to reject the notion that scientific theories could ever be proven in some ultimate sense. One of these, Arthur Bateman, used the example of the ether to show that theories are constructs designed to explain in the most economical manner a large body of facts. The ether's existence could not be proven,

43 Argus, 1 July, 1869.

44 Charles Perry, op. cit. note 38, 3-4.

45 Argus, 1 July 1869, and Charles Perry, op. cit., note 38, 8-9.
according to Bateman, yet it was believed to be there on the basis of its explanatory power. The same might be said of Darwin's theory; it explained many facts 'in a wonderfully clear manner' and 'no facts can be shown diametrically opposed to it'. The only other theory available to explain the origin and development of animal and plant life was the miraculous appearance on the earth's surface of new forms to take the place of extinct ones. For Bateman this was plainly unscientific for it was opposed to the tenet that 'the scientific mind' should 'not accept as cause to effect those agencies which belong to the marvellous when causes less improbable can be rationally conjectured'. Bateman did not intend to reject traditional religious belief, for Darwin's theory was proposing a mechanism for understanding the creation and development of life forms which should be seen as being 'the manner in which the Creator produced the forms known to have existed'.

In summary then, there were three approaches to science evident in the dispute over protoplasm. One, exemplified in the writings of Perry and Higginson, appealed to a strong providentialist programme based on a Baconian philosophy of data collection and theorising only after all the facts were in. The second, represented by Bateman and in modified form by Bromby and Archer, might also be described as providentialist in that it was still predicated on the view that scientific endeavour was legitimately concerned with understanding the Creator's aims and intentions. The third approach was that of Huxley himself, and represented by Henry Gyles Turner, in which science was to be understood as a legitimate field in its own right, owing nothing to religious sensibilities or the demands of theology for rational proofs of the Creator's intentions.

Protoplasm as a talking point and a topic of public discussion quickly became entwined in the debate over Darwinism; Perry, Bromby, Higginson, and Bateman all treated it as if it were part of the wider debate over the Darwinian theory, as indeed it certainly was when viewed from the sort of perspectives detailed above. The discussion virtually ceased however when a more directly Darwinian issue arrived on the scene, namely that relating to the antiquity of man. As one anonymous correspondent in the Argus put it, 'Man, pre-historic or

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46 Argus, 2 July, 1869.
otherwise, is a vastly more interesting subject than protoplasm'. This may have overstated the case somewhat but nonetheless was probably true for many of the general public.

PRE-HISTORIC MAN
The first occasion on which debate over the antiquity of the human species occurred after the publication of the *Origin of Species* was when Charles Lyell's book *The Antiquity of Man* appeared in 1863. Mention was made in the previous chapter of the attack made upon the book by the anti-Darwinian forces in Melbourne, led by the *Age*, during the dispute over man's place in nature. As was often the case in Australia, it was a clergyman who first took up the issue; in this case, the individual in question was particularly interesting because not only was he a Catholic priest, he was also one of the best qualified geologists in Australia. Julian Tenison Woods overcame sectarian prejudice to earn the respect of his scientific peers, becoming President of the Linnean Society of New South Wales in 1879. In 1863 he lectured on the topic of the antiquity of man, in Robe, a small country town in South Australia, and a year later published the text of the lecture in Melbourne. Entitled rather facetiously *Not Quite as Old as the Hills*, the pamphlet was an attack on both the particular issue of a great antiquity for the human species and the uniformitarian doctrine in geology which Lyell had done so much to establish as orthodoxy. Woods pointed out that there was no certain way of dating the past or of obtaining an objective measure of the length of time man had been on the earth. He examined the evidence for the claim that this period must have been over nine thousand years in length; the cumulative evidence used by Lyell and others looked impressive, but when analysed case by case, this same evidence fell away. For Woods, four thousand years seemed to be a reasonable estimate of the period of human existence, a figure which squared rather better with the scriptural account. Like Perry later, Woods decried the tendency to speculate without sufficient evidence and the trend to put forward 'modern inferences' that 'clash with all that the human race has considered hitherto as unshaken truth', which seemed

47 *Argus*, 24 August, 1869.

to show 'that there is something wrong somewhere'. Despite his misgivings Woods was not entirely antagonistic to the evolutionary cause. In 1879, giving the Presidential Address to the Linnaen Society of New South Wales, he praised Darwin for 'his philosophical method of inquiry in which he has set so beautiful, so illustrious an example' and went on to claim that 'if tomorrow the evidence of its [evolutions] occurrence were established on indubitable grounds it would be one more beautiful illustration of the plan of nature.\(^\text{50}\)

Woods's pamphlet is said to have been much discussed, but the issue really emerged publicly with a lecture given before the Early Closing Association in Melbourne in 1869 by John Bromby and entitled 'Prehistoric Man'. Significantly, while the earlier debate over man had, on the surface at least, been publicly fought out on grounds that might, broadly speaking, be termed scientific, the new dispute centred largely on theological interpretation and the meaning of scripture. There is an irony in the fact that Bromby should use the Early Closing Association Lectures for his platform. The Association had been brought into being by a number of prominent citizens in Melbourne concerned at the rise of anti-religious and free-thinking organisations and the effects these were likely to have on the uneducated classes. By persuading local businesses to close for a period on one day of the week and offering lectures from recognised experts in a variety of fields during that period it was hoped to counter the 'subversive' activities of such organisations.\(^\text{51}\) Bromby's lecture on man, while mild by the more extreme standards of the time, was almost guaranteed to create discord amongst the religious; the fact that it was his Bishop, Charles Perry, who most forcefully responded to the more controversial of the claims he made in the lecture, underscored the extent to which theological positions could set the boundaries for debate on issues that were perceived as crossing the scientific and religious divide.


According to Manning Clark, Bromby was 'a disciple of Maurice and Kingsley', implying that he adhered to the social gospel the two most prominent Christian socialists preached.\textsuperscript{52} Theologically, Bromby is more difficult to place. While, like Kingsley, he was prepared to welcome new scientific truths and firmly believed that they could do no real damage to Christian belief when interpreted aright, his acceptance was always tempered by the need to interpret both the science involved and the religious issue at hand as if they were part of the same problem. What this means may become clearer later. Bromby was sympathetic to the theological position broadly defined as 'conditionalism'. Conditionalism has been described as the doctrine that 'God created man mortal but with the capacity for immortality'.\textsuperscript{53} That is, in contradistinction to the universalists, who believed that ultimately all men would be raised up to eternal life, and the Calvinists, who claimed that only a predestined elect would be so chosen, conditionalists taught that God gave man the option of accepting a share in eternity through accepting the saving grace of Christ. The interest of this for the discussion here lies in the fact that despite the eighteenth-century origins of the modern formulation of the doctrine, its supporters after the publication of the \textit{Origin of Species} were wont to use the language of Darwinism when describing or defending their position. Thus those that were raised to eternal life were described as the 'fittest to survive', having made the right choice in their earthly life. Henry Constable, a prominent British spokesman for the conditionalist position, defended the view that the heathen and uncivilised races who had never received the message of the gospel would be annihilated along with those in the civilised world who had deliberately chosen to reject it with an analogy that conjures up a Darwinian picture.

\begin{quote}
We find in nature that death and destruction are God's usual agents in removing from their place things animate and inanimate, as soon as they cease to discharge the part for which they were intended ... Whole races of living things have long ceased to exist ... In our view God does
\end{quote}


but apply to higher races for their sin that which He has applied to lower races who knew no sin.\textsuperscript{54}

The use of such Darwinian-sounding analogies often allowed conditionalists to accept some of the more controversial aspects of scientific investigation. Bromby himself resorted to similar analogy when arguing that the Christian faith was the fulfillment of the primitive yearnings after immortality found in ancient Greek and Scandinavian religions and amongst contemporary Indians in North America. These yearnings were, according to Bromby, analogous to the powers often foreshadowed in nature as creatures moved in time 'from a mollusc up to man'. Similarly, 'Reason and other attributes of the human soul have their foreshadowings in the brute creation'. \textsuperscript{55}

While the extent of Bromby's acceptance of Darwinism has sometimes been overstated, his use of contemporary scientific literature favourable to evolutionary theory when speaking publicly on the issue of science and religion, is clearly evident. The empirical content of his lecture on pre-historic man was extracted in large measure from Lyell's \textit{The Antiquity of Man}, and while Lyell was cautious in his acceptance of evolutionary theory the book was usually taken as supporting Darwin's case. Bromby's later sermons on Genesis seem to have been drawn from the writings of the liberal Anglican, Baden Powell, one of the first English clergymen to welcome Darwin's work. There were enough theological checks on Bromby's acceptance of evolutionary theory, however, to ensure that his position often puzzled those who saw the issues in less sophisticated terms.

According to Bromby, the first generation of men lived in the classical 'golden age' of antiquity, knowing no sin. From this idyllic 'nomadic and pastoral age developed the agricultural', social organisation emerging from competition between groups. The Biblical figure of Cain represented 'those who first cultivated the land and who thereby concentrated populations in the towns'; this concentration of population stimulated intellectual growth because urban living increased artificial wants. The length of time required for this gradual transformation of society made nonsense of Archbishop Usher's dating

\textsuperscript{54} Ibid. 196.

of human history to around six thousand years, and Bromby claimed that both geology and archaeology had combined to undermine the traditional dating which had been based on a literal acceptance of the ages of the patriarchs as given in the Bible. Attempting to harmonise scripture with the findings of modern science while seeking at the same time to preserve what he saw as the real intentions of the Biblical writers, Bromby reinterpreted the years allotted to the patriarchs as months. This rendered the life spans involved more credible to sceptical modern ears and countered the ridicule of freethinking critics all too ready to dismiss the more than nine hundred years that scripture taught as the age of Methuselah. For Bromby, the Bible was a collection of great religious documents, which had never been intended as scientific records, nor to be the cause of 'mind shackling literalism'. Provided that the intentions of the various authors, or the overall message of the documents, were not violated, then the Christian was free to reinterpret scripture in the light of modern thinking. This was not a view shared by many of his clerical colleagues.56

Three aspects of Bromby's talk on prehistoric man became the target of public criticism; his claim that the first men knew no sin, his reinterpretation of the patriarchal years as months and his overt acceptance of a social-evolutionary history of the human species. It was claimed that the first went against the plain words and intention of the writer(s) of Genesis while the second had little or no scriptural support because both the Hebrew and Septuagint versions of Genesis spoke of years, months and days in relation to the patriarchs.57 While these were admitted to be matters of interpretation (and Bromby went to great lengths to defend himself against his accusers on this matter), the proposition that man had risen rather than fallen in his earliest period, became the centre of debate in large measure because it was seen as bringing science and religion into direct conflict.

The Reverend George Mackie, for one, rejected the 'alleged facts' cited by Bromby to support the supposed prehistory of man and his emergence from a state of barbarism 'such as we see in the Aboriginals

56 John Bromby 'Prehistoric Man', a lecture presented before the Early Closing Association, 9 August, 1869. I have sighted only the report of the lecture given in the Argus, 10 August, 1869.

57 Argus, 12, 19, 21, 24 August, 1869.
of Australia'. He opted instead for a version of the Anglican logician and
divine, Richard Whateley's, degenerationist theory of human history,
wherein man had fallen from a previously exalted position and not risen
from a primitive state. In Genesis, Mackie believed that 'we have the
authentic history of man set out'; the Christian was not at liberty to pick
and choose what he thought was inspired in the divine records and
Bromby's attempts at scriptural re-interpretation placed him in the
same unacceptable camp as the Scriptural modernisers Renan and
Strauss. For Mackie, genuine science was the search for truth, but it did
not go beyond the evidence and always aligned itself with its twin, the
Bible, for if the facts of Genesis were wrong then the moral scheme of
Christianity collapsed. 58

This uneasy cobbling together of a narrowly defined attitude
towards science and a literalist attitude to the Bible pervaded much of
the criticism of Bromby. The Reverend R. M. Henderson, in an 'Address
to Young Men' proposed a restricted inductivist methodology of science
and used it to show up the 'fallacious reasoning and false theories -
protoplasm, pre-historic man and the Darwinian theory' then in
vogue. 59 This sort of attack did little justice to Bromby's position. His
acceptance of evolutionary theory was extremely limited in both
biological and social senses; he made the point for example that however
much might be said about biological change prior to man's appearance
on earth, it was quite clear that there had been no such change since his
arrival. As God's covenant with man began only when he breathed
spirit into Adam, the individual, rather than at the appearance of Adam
the species, anything that had gone before was theologically irrelevant
for the Christian scheme to be workable. The pre-Adamites in the first
sense might be the result of biological evolution; once the individual
Adam had been singled out for special blessings it effectively meant that
a new creature, mankind, was brought into being, with its tripartite
nature of body, soul and spirit. The Christian was therefore allowed any
amount of speculation about the pre-Adamite world, scientific or
otherwise. 60 This at least was Bromby's view. The entry of Charles

58 Argus, 19 August, 1869.
59 Argus, 23 August, 1869.
Perry into the dispute signalled the growing anxiety being felt by sections of the colonial establishment.

Perry was put under some pressure to respond publicly to Bromby's lecture on prehistoric man which he had chaired and described as a 'pleasure' and 'able and interesting' although he 'did not agree with all the inferences he [Bromby] had drawn from his scientific research'. In an address entitled 'Science and The Bible' Perry ranged widely across the spectrum of controversial scientific theories, including Darwinism, Vestiges, and protoplasm. As in his lecture on 'Genesis and Geology' nine years earlier, Perry stressed at the outset that he was not intending to oppose the Bible against science, or seeking to define the boundaries of each in ways that put them into separate compartments of life. Repeating his previous assertion that religion had nothing to fear from 'true science' and that, properly understood, geology confirmed in broad outline the account of creation given in Genesis, Perry went on to take Bromby to task. While the facts of linguistics and archaeology were real enough there was no necessary reason to interpret them, as Bromby had done, so that they favoured a social-evolutionary history of man. The existence of the stone age culture of the Australian Aborigine contemporaneously with modern European culture was proof enough that a sequential, progressive development of human culture was an oversimplification. Like Mackie, Perry preferred the degenerationist theory of Whately, especially as it better fitted the Biblical account. He rejected Bromby's interpretation of the word 'Adam' as a generalised term for mankind, pointing out that Paul's words in Corinthians and Romans explicitly repudiated such an interpretation.

Perry favoured the idea that the Bible was to be understood as correct in 'every statement' it contained, although he granted that this was not the view of every Christian. Whatever the findings of science, they were unlikely to overthrow the 'cumulative evidence' of the

60 John Bromby 'Prehistoric Man', Argus, 10 August, 1869. See also Bromby's replies to critics in Argus, 23 & 31 August, 1869 and his lecture on 'Creation versus Development', op.cit, note 40, 16-23.

61 Argus, 10 August, 1869.

62 Charles Perry, op.cit, note 38, 3-4.

63 Ibid. 16-19.

64 Ibid. 20.
Old and New Testaments as regards the Christian scheme; indeed his listeners were assured that 'all questions relating to science will be settled without any discredit to the Bible'.

Perry's address proved to be the high water mark of the debate. Indicating the extent to which it was a response to establishment fears about growing liberalism in scientific and religious thought it was attended by an impressive array of the social elite. The Governor's wife and daughters were joined by a number of well known judges, prominent politicians and members of both Houses of Parliament, along with Frederick McCoy and the leading Presbyterian, Adam Cairns. At the conclusion of his talk, Perry 'evidently exhausted, sat down amidst long and repeated applause', and McCoy moved a vote of thanks which was carried by acclamation. The uneasy alliance between true science and revealed religion had been upheld, and with it the authority of those vested with the task of upholding social order in the face of 'the brutality of the mob'.

CONCLUSION
The entanglement of science and theology in early debates over Darwinism in Australia should not be taken as evidence that there was an ongoing 'warfare' between the two. While there was often a degree of ignorance displayed on both sides of the Darwinian debate regarding the relative position of individual proponents, a division into strictly hostile camps is neither useful nor historically accurate. What was so often at issue were perceptions on the one hand, of the position of man in the natural world and the overall scheme of history, and on the other, the relative positions of science and religion as arbiters of true knowledge. The creationist-providentialist scientific episteme was far from overthrown in biology even a decade after the publication of the *Origin of Species*, the one book of all others which contained the seeds of the downfall of design in the natural world. Design was of course the foundation stone on which the aforementioned scientific episteme was built, and it lay at the heart of some impressive testimonies to the investigation of nature and the uncovering of 'nature's God'. It was design which was the issue behind the debate about man, as William

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65 Ibid. 22-23.

66 *Argus*, 21 September, 1869.
Macleay grasped, albeit in crude terms. To a large extent it was design which was behind the debate over protoplasm.

But at a further remove again, behind the concept of design stood a greater challenge for the participants in both disputes. What was the true nature of biological science and what was to be its role in arbitrating knowledge claims? If the older teleological view of biology was to be abandoned - a view easily united with religious doctrine and thus gaining power through the alignment of faith and reason - what was to replace it? Huxley was quite explicit about his aim to separate biology from theology, and from any form of teleological explanation, so that it could be a science like any other established science. To those like Perry, McCoy, Mueller and Macleay, this was tantamount to amputating one of the major limbs from the body of science. Worse still, as Barkly and Macleay recognised, and as the movers and shakers behind the Early Closing Association and those who pressured Perry into responding to Bromby just as surely saw, the secularising of biology was the thin end of the wedge. To allot to science and religion completely separate realms of authority over the validation of knowledge claims was to introduce the possibility of a secularised public polity based on a Comtean positivism, with the inevitable result of an undermining of traditional mores and social institutions.

There is one other important factor to be considered. The religious response to Darwinism does not divide clearly into denominational groupings. Bromby and Perry were Anglicans, as were Henderson, Higginson and the scientists McCoy and Halford, yet there are at least three differing positions visible in their responses. Bromby was to some extent an 'accomodator' of evolutionary theory with religious belief; Perry, Henderson, Higginson and probably McCoy wanted no truck with evolutionary theory under any circumstances; while Halford wanted to adopt Huxley's secularist biology and to keep the clergy out of science, while maintaining a providentialist epistemology. Tenison Woods, a Roman Catholic, was prepared to examine the possibility of evolution, while his fellow priest and President of the Royal Society of Victoria, Bleasdale, believed the reasoning which led to the acceptance of evolutionary theory was fundamentally a 'swindle'.

In summary, around the often acrimonious disputes over aspects of evolutionary theory that occurred in Australia in the first
decades after the publication of the *Origin of Species* were wrapped a bundle of deeper philosophical, theological and social concerns. What was at stake was not simply 'new knowledge' about the natural world but a whole new way of going about constructing that knowledge. Faith and reason were now being increasingly promoted as separate realms of human experience and the alliance of science and religion was in the final stages of being broken.
CHAPTER 5

EVOLUTIONARY THEORY, SOCIAL PROGRESS
AND POLITICAL ECONOMY IN VICTORIA:
WILLIAM EDWARD HEARN AND DAVID SYME

The common context of intellectual life that Robert Young has discerned underlying the debates about man in nineteenth-century Britain encompassed most aspects of socio-political debate. As the last chapter illustrated, discussion of the relationship between religion and science underlay much of the controversy surrounding both Darwinian and non-Darwinian evolutionary theory in Australia. But there were other strands of social life which were touched, and often powerfully influenced by, the ideas of evolutionary development and social progress. While it must be reiterated that there was no necessary connection between these ideas - indeed, that there was or was not a connection between them was a central issue for Darwin and his closest allies such as Hooker and Huxley - many of those taking up the idea of biological evolution did so precisely because they perceived it as supporting a previously held commitment to the idea of social progress. While this may be an attitude which modern scholarship attributes more to Herbert Spencer than to Darwin, it is unlikely that nineteenth-century opinion would have made much of the distinction. In any event those involved in formulating a theoretical framework for understanding the workings of the socio-political realm showed themselves more than willing to be eclectic in such matters, to the extent that conflicting conclusions might be reached from premisses based on the same sources. There is some irony in the fact that Darwinian theory, drawing as it did in large measure on the writings of political economists and natural theologians, should in turn be ploughed back into political discussion and questions of social development. The irony dissipates when it is remembered that ideas and values are socially constructed and exist in complex relationships with each other. The resources available for carrying on such discussions are constantly changing and are never neatly packaged; ideas, values and personal commitments tend to be supported from whatever resources came immediately to hand. This is evident in the way that anthropological, biological and historical material was ransacked, in the last quarter of the nineteenth
century, to build systems, sometimes cosmic in extent, and often based on ideas seen as evolutionary. Herbert Spencer's *Synthetic Philosophy* is the best known of the British examples, but his American disciple John Fiske perhaps captured the optimism of the systematists even better when he entitled his own attempt at system building *Outlines of Cosmic Philosophy*.

In the field of political economy many components of social discourse intermingled and it was more or less impossible to discuss the methods and working of economics without embedding the discussion in some form of social theory. One had to know how society operated, and how it developed, if one was to provide a convincing picture of the social relationships that underlay economic life. To be a political economist one had to be a historian, sociologist, anthropologist and psychologist; or at least be sufficiently conversant with those disciplines to be able to confidently incorporate their findings into a fully developed synthesis.

In this chapter the work of two of the most significant intellectual figures in the life of nineteenth-century Australia is discussed in some detail. Both were strongly influenced by evolutionist theories and by the idea of progress; both published their systems of political economy and both received critical acclaim locally and overseas. Yet the conclusions they arrived at were diametrically opposed, reflecting the economic and political divisions existing in the social context in which they worked out their ideas - the colony of Victoria in the years following the gold rushes of the 1850s. The central political question then being discussed centred on the relative merits of free-trade and protectionism; the social, political and economic ideas propounded by William Edward Hearn and David Syme were formulated directly in response to this question.

**HEARN'S LIFE AND WORK.**

William Edward Hearn was born in County Cavan, Ireland in 1826, the son of an Anglican minister. He entered Trinity College, Dublin in 1842, studying classics, logic, ethics and law. In 1853 he was chosen as professor of Greek in the newly established Queen's College in Galway. A year later a committee headed by Sir John Herschel nominated Hearn

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as the best candidate for the chair of Modern History and Literature, Political Economy and Logic at the University of Melbourne. In 1857 these responsibilities were reduced to History and Political Economy. Hearn numbered among his students the cream of the next generation of Australian politicians, legal experts and writers, including Alfred Deakin, Henry Bournes Higgins, Isaac Isaacs, Alexander Sutherland and Samuel Alexander. A dispute over the legality of professors holding political office led to Hearn resigning the Chair to become Dean of the new Law Faculty in 1873. Now free from University statutes respecting professors, he succeeded, at the third attempt, to enter Parliament and continued as a member of the Victorian Legislative Council until his death in 1888. He was briefly Chancellor of the University of Melbourne and also chancellor of the Anglican Diocese of Melbourne from 1877 until 1888.

During his time in Australia Hearn wrote four books, three of which were widely admired internationally. *Plutology: or the Theory of the Efforts to Satisfy Human Wants* was published in Melbourne in 1863 and in London a year later. *The Government of England* was published in 1867, and *The Aryan Household* in 1878. In 1883 he produced *Legal Duties and Rights*, an attempt to bring together the various aspects of English Law as they applied in Victoria. Prior to his arrival in Australia Hearn had written but not published a work entitled *On Natural Religion* and it is with this that one should begin when seeking to gain an insight into the development of Hearn's thought. Before that however it seems prudent to take a closer look at Hearn's university career in Ireland, for this both sets the scene for and gives an insight into his later writings.

**HEARN, WHATELY, POLITICAL ECONOMY AND NATURAL THEOLOGY.**

One of the dominant intellectual forces which Hearn encountered as a student at Dublin was Richard Whately. A prominent writer on Logic, political economy and a variety of religious topics, Whately held the chair of Political Economy at Oxford before being made Archbishop of

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Dublin in 1831, when he also became ex-officio Visitor to Trinity College, Dublin. He founded the Chair of Political Economy at Trinity which as a consequence bore his name. The University Calendars show that Whately's books constituted a major resource in a number of areas of study; while in 1846 the University printers listed only three amongst its publications, two years later this had risen to 11, the additions being on religious topics. Whately's Introductory Lectures on Political Economy were a recommended text for entrants in the Political Economy Prize at Trinity from 1837 onwards. Hearn won the Prize in 1847, and as a Senior Freshman in Honours was subjected to Whately's works on Logic.

There is more direct evidence of the influence of Whately on Hearn, of a sort that has a bearing on the matter at issue in this chapter. Whately's importance for the history of the human sciences rests in part on his support for the degenerationist theory of human society. While the theory did not originate with Whately, he did more than any other individual to promote its acceptance, using it to explain the coexistence of 'advanced' industrial societies and 'savage' or 'barbaric' ones, on the premiss that the latter had deteriorated from a more sophisticated stage of development and were not the remnant of some earlier stage of humanity. The basis for Whately's belief was remarkably simple. All historical evidence shows that backward societies become more sophisticated only when they are brought into direct contact with an already advanced society which, as it were, plants the seed - or in a more Whatelyan phrase, educates the ignorant. No civilised society had ever risen under its own steam from utter barbarism. Taken back far enough, the situation was arrived at when some non-human influence must have given the original spark for social progress. For a Christian like Whately this outside force must be no other than God.

Whately's views on the origin of society were an integral part of his political economy, which he interpreted in terms of Natural Theology to the extent that he predicted that when the structure of human society was fully understood it would show divine contrivance.

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4 *Calendars*, Trinity College, Dublin, 1848.

The connection between Natural Theology and early Political Economy was recognised by the nineteenth-century economist Thomas Cliffe Leslie, who pointed out that Adam Smith's economics were the outcome of his belief in the beneficent natural order of society. Smith was required to teach Natural Theology as one of his duties as Professor of Moral Theology at Glasgow, and he promoted the view that the beneficent natural order of society ought not be interfered with by human institutions; when this had occurred nothing but ill had come of it. Whately's own combination of natural theology and political economy was therefore not unusual.6

Sometime in 1853 or 1854, prior to his departure to Australia, Hearn completed a manuscript entitled On Natural Religion.7 Two distinctly Whatelyan themes can be discerned running through this work. The first is an acceptance of the integral relationship of political economy and natural theology. Whately had claimed that the combination of the two would throw light on 'the wisdom of contrivance' which the structure of organised bodies displays. This type of example was usually drawn from the organic realm but, according to Whately, society was in its own way 'organic' and studying it through Political Economy might throw light on 'the designs of a wise Providence, and ... [help to] devise means to remove the impediments to their completion'. Social progress itself was dependent on the division of labour and 'the security of property'. Within society, individuals tended to act in their own selfish interests, hence competition ensued. Paradoxically, the sum total of this selfish and competitive spirit actually led to a society where everyone benefited. That is, the individual interests of each member of society ultimately coincided with those of all other members.8

In his unpublished manuscript, Hearn accepted Whately's line almost unchanged. He mentioned the ceaseless conflicts of interests between individuals in modern society which nonetheless led to the general good.


There is none of the great laws which govern society that is not directly beneficial. The combination of labour engages for productive purposes the maximum of power. The division of employment evolves the maximum of skill. The competition of individual interests secures to society the greatest possible advantage from the labour and skill of its members, and ensures the most satisfactory distribution of their products. The coincidence of these individual interests with the general interests of society promotes harmony among all classes of the community and saves the country from the retardation of its progress by frequent and fatal collisions between its component parts.9

The second Whatelyan tenet accepted by Hearn at this time was the degenerationist view of human history. On the face of it, Whately's degenerationist beliefs would seem to be in contradiction to his ideas of social progress. However, once it is accepted that there is some divine intervention necessary to ignite the process initially the contradiction disappears. As shown in the previous chapter when Bromby was taking a similar line, from a Biblical viewpoint, the example of Adam's sons Cain and Abel, who owned cattle and tilled the land respectively already displayed the benefits of a division of labour. It was a short step from this to drawing up a scheme of human history that accounted for the rise of civilised societies and the continuation of savage and barbaric ones; some societies were heir to the Biblical blessings, some were not. At the time he composed his manuscript Hearn accepted this combination of degenerationist and progressive elements. On the one hand, 'As the ape cannot have risen to the savage, so neither can the savage have been spontaneously developed into the civilised man. Such a progress is inconsistent with all we know of the present tendencies of civilisation'10

On the other hand, and here Hearn quoted directly from Whately, 'According to the present course of nature, the first introduction of civilisation among savages is, and must be, man in a more improved state'.11

Interestingly, this reference came while Hearn was critically discussing the theories of Lamarck and the author of *Vestiges.*

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9 William Edward Hearn, op. cit, note 7, 91.

10 Ibid. 138.

11 Ibid. 140. Hearn does not give the source of the quote from Whately.
both of which he, like Whately, was at that time strongly opposed to.
Therein lies the most difficult but most historically interesting question
relating to Hearn's intellectual development, for less than eight years
later, by then well ensconced in Melbourne, he produced Plutology. Most
commentators on Hearn have recognised this book as an original
contribution to the literature of Political Economy and, even in its own
day it was seen by many good judges as a successful attempt to graft the
theory of evolution onto a social science. There is no doubt that
Plutology does rely on an evolutionary view of the development of
human society (though one not quite so Darwinian as many have
claimed), so what brought about this change from his earlier position to
one which at first sight seems to be the complete opposite?

In the first place the change is in fact probably not so
extreme. Hearn was able to continue within the Anglican Church
without apparently going through any of the soul-searching endured by
many who accepted some form of evolutionary scheme of human
history. Many of the components of his mature theory of Political
Economy were already prominent in his earlier work; society as an
organism subjected to the same laws as the natural world, the notion of
a division of labour in society which naturalists (including Darwin) had
utilised when dealing with the natural world, and of course the idea of
beneficial competition. Like many of his contemporaries, Hearn gained
from Darwin's reworking of old material. The economic metaphors that
are to be found in the Origin allowed his readers to see many things in a
new light. In their turn some of these readers, Hearn among them,
reworked the metaphors and applied them in other areas with a greater
emphasis on progress. Hearn was still not prepared to say that
untutored savages might transform themselves into civilised social
creatures, but the question was now relegated to a position of little
importance, for regardless of how civilised society originally got on the
progressive treadmill, the fact was that historical evidence showed that

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12 Among those impressed by Plutology was John Fiske, already mentioned for his
attempts to construct an evolutionary cosmological scheme. Fiske described it as 'an
erudite and ponderous work'. See John Fiske, American Political Ideas Viewed from
the standpoint of Universal History, (London: Macmillan & Co, 1885), 142. Leslie
Stephen reviewed it very favourably in the Reader, 19 March, 1864, 142. La Nauze
mentions that W.S. Jevons and Alfred Marshall were both impressed as was
(interestingly in the light of current day economic theory), F. von Hayek. See J.A. La
Nauze, Political Economy in Australia, (Melbourne: Melbourne
the tendency was to social improvement and increasing complexity of
the social organism.\textsuperscript{13} The last point was further supported by the fact
that the new biological theories were showing the importance of organic
unity and the efficiency of the division of labour in the organic world.
Hearn's new position, then, as exemplified in \textit{Plutology}, was the result
of a reassessment brought about by a recombination of pre-existent
materials into new forms and structures. This explains also why so
many of the sources referred to in the unpublished work on natural
religion were again brought out in \textit{Plutology}, a book of political economy.
Of course, \textit{Plutology} also included many new references. Herbert
Spencer and John Stuart Mill were far more in evidence in the new
work, for instance, as was befitting to the foremost social evolutionist of
the day and the author of the most influential work on political economy
since Ricardo.

\textbf{PLUTOLOGY}

The first extended attempt to analyse Hearn's work in political economy
in the twentieth-century was undertaken by Douglas Copland in 1935.
Unfortunately, Copland's study was skewed by his explicit use of
Hearn's work as a springboard for analysing contemporary economic
problems, while his concentration on the technical features of Hearn's
economics gave the impression that there were universal verities in
economic analysis that were not dependent on social, cultural, or
historical context.\textsuperscript{14}

Fourteen years after Copland's book appeared, John La
Nauze published his study of the history and development of political
economy in Australia. According to La Nauze it was Hearn's use of
biological theory when discussing social problems, that was his most
original contribution to political economy. Hearn was the first writer
'systematically to apply the Darwinian theory of organic evolution to
political economy and to insist that the proper method for the study of
economic society was biological'.\textsuperscript{15} However, while Hearn went beyond
mere analogy by stressing that society was itself an organism, La Nauze

\begin{itemize}
\item \textsuperscript{13} William Edward Hearn, \textit{Plutology: or the Theory of the Efforts to Satisfy Human
Wants}, (Melbourne: George Robertson, 1863), 136.
\item \textsuperscript{14} Douglas Copland, \textit{op.cit}, note 2.
\item \textsuperscript{15} J.A. La Nauze, \textit{op.cit.} note 12, 61.
\end{itemize}
believed that his use of evolutionary theory was often little more than a superficial and fallacious attempt 'to justify the natural or spontaneous results of free competition'. As we shall see, this may have been a harsh judgment, for Hearn's beliefs about social progress were in fact embedded in his thinking by the time he came to write his book and while his allusions to evolutionary processes are not particularly sophisticated they are at least consistent with his overall program.

There is more justification in La Nauze's claim that there is very little history in Plutology, a surprising fact given that the book has a distinctly historical intent. In effect, Hearn does history backwards for, in contrast with Whately but in common with many of his contemporaries, he begins from the standpoint of modern industrial society and assesses the primitive, barbaric or archaic communities still to be found in the world, as though they are the surviving remnants of an earlier stage of human development. What underlies Plutology is the belief that social behaviour, even when expressed in terms of political philosophy, is at base determined by natural law. Speaking at an election rally in 1874 in favour of one of his most passionately held beliefs - free trade - he asserted that 'No law of physical nature has been established more conclusively than the doctrine of free trade'.

Perhaps because the bulk of Whately's writing on political economy was unoriginal, neither Copland nor La Nauze recognised his importance in the formation of Hearn's thinking. Certainly Copland was not aware of the unpublished essay on natural religion. La Nauze on the other hand, rediscovered it and brought it to public attention. It is also the case that, while in the essay on natural religion Whately's influence is manifest, especially where it relates to the beneficent providence behind human society and the impossibility of an 'utterly savage and barbarous' society rising under its own volition to a higher stage, in Plutology there is only one reference to him and that a criticism by Hearn of Whately's belief that parties to exchange are not necessarily always free agents.

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16 Ibid. 63.
17 Ibid. 63.
18 Ibid. 78.
What then did Hearn carry forward from the unpublished work to the published one which might be attributed to the influence of Whately? Firstly, the belief that man was a social being with instinctive and innate desires for sociability; secondly, that the social order was based on beneficent principles; thirdly that Christianity and political economy went harmoniously together, inasmuch as the wealth encouraged by the latter worked to the good of everyone in society, not just the individual. Note that this implies that both Hearn and Whately believed political economy to be prescriptive and not merely descriptive or theoretical. Finally, there is the acceptance that, in the words used by Hearn in the essay, 'We find that material prosperity generally attends the discharge of moral duties while poverty and disgrace are the consequence of their violation'. In other words, there is a moral order running through society.20

Apart from the influence of Whately there are other aspects of the unpublished work that are retained in Plutology. The most interesting of these for the purposes of this chapter is the use of biological metaphors and analogies. In the earlier work he alluded to the manner in which the development of the individual organism parallels the way in which the larger units such as species and genera are developed. In Plutology Hearn develops the idea of the social organism as a body of selfish competing individuals who nonetheless are interdependent and whose combined actions work for the common good. This last point is also found in Whately, but grafting it to the idea of the social organism shows the influence of another and altogether different thinker. Between writing the essay on natural religion and Plutology Hearn read some of the work of Herbert Spencer, including First Principles, and, while there are only seven acknowledgements of Spencer in the published work, there can be little doubt that it is his theory of the social organism that Hearn has in mind.21

It is perhaps ironic that the Whatelyan material underpinning the essay on natural religion should be re-interpreted in

20 William Edward Hearn, op.cit, note 7, 93.

21 See for example Plutology, page 304, where Hearn is discussing the adaptation of industry to meet new situations and quotes Spencer to the effect that just as in the biological realm parts of an organism begin in simple form and gradually become more complex, so 'this law equally extends to the social organism'.

Spencerian terms in *Plutology*. Spencer was the foremost proponent of social evolution while Whately was its most trenchant critic. That Hearn could apparently switch allegiances from one to the other without altering the fundamental outlook of his social and political theory may at first sight seem incongruous but, on reflection, it becomes clear that what the change amounts to is no more than the rather abstract and distant question of the origin of society. As pointed out above, regardless of whether or not the emergence of industrial society from a more primitive stage is possible only with the aid of some outside intervention or is the result of a long evolutionary process, the true basis of that society remains the same in Hearn’s view. The moral order underpins both, for while in the one instance beneficent providence guarantees social stability and steady material growth, in the other it is the demands of natural law and the gradual emergence of heterogeneity from homogeneity, which Spencerian theory postulated as a manifestation of natural law, that provides the guarantee.

Hearn began *Plutology* with a discussion of what the subject matter of political economy ought to be. The common notion that it was to do with national wealth he rejected, preferring to look at the nature of wealth and proposing that the true focus of investigation ought to be the attempt to understand how the wants of the individual in society are satisfied by ‘human effort and the contrivances by which achievements are reached’. In a phrase that summed up much of the approach of the book he wrote ‘Society is not different from its component parts, it only establishes between those parts certain relations which are additional to the power of the isolated man and do not supersede them’.22 As human society advanced, so human knowledge made improvements in the industrial state possible ‘The course of human industry is from the worse to the better and not otherwise’.23 Labour is aided by capital, cooperation, invention and exchange - all distinguishable but always interrelated. At this point Hearn explicitly rejects the degenerationist part of the Whatelyan view of the origin of society; the industrial organisation of society is spontaneously formed as a consequence of the law of progress, 'one of the most striking phenomena that nature, amid

22 Ibid. 5.

23 Ibid. 8.
all her wonders, has presented to us'. The growth of society leads to ever greater complexity; complexity brings Government, which, when it limits its activities to its proper function, is beneficent to industry. Those functions connect with the 'moral constitution' of society and are based on 'justice'. The 'law of evolution' comes into operation as political groups begin taking on a permanent form, and as the 'organs' of society become more marked, so, as in organic nature, their functions become more specialised and precise. The role of Government is basically to maintain the rights of the individuals that make up society, rights that allow each individual to pursue his own interest, so long as in doing so he does not impede others from pursuing theirs. In practice, Governments are there to defend life and property, which are the physical manifestation of rights. Echoing the laissez faire philosophy of Adam Smith and the utilitarians, Hearn claimed that Governments become impediments to the growth of industrial society when they fail to carry out their proper functions, or carry them out improperly, or engage in duties that are not within their legitimate domain. Not surprisingly perhaps, Hearn pinpoints taxation as the area in which Governments most commonly cause most damage to the health of society. Taxation ought to be levied from each individual according to income and not applied indiscriminately or indirectly, for that would add unwarranted costs and bureaucratic red tape to the production of wealth. Other 'invalid' forms of state intervention which are liable to interfere with the healthy functioning of the social organism arise from over-regulation of industry, price control and demarcation lines. State control must, then, be exercised within well defined limits, according to Hearn. He describes such control as stemming from a lack of faith in the natural processes of social progress and the inability or unwillingness to perceive the proofs of that progress in the historical examples that are to be found in abundance.

24 Ibid. 9.
25 Ibid. 11.
26 Ibid. 334.
27 Ibid. 426-35.
28 Ibid. 444.
Society itself arises as a result of the 'fixed principles of human nature' and is regulated by equally fixed laws. Self interest is the basis of the moral scheme, but Hearn quotes the economist Paulett Scrope to the effect that 'while all members of society co-operate for a common purpose, the increase of the general welfare, each individual is still strictly occupied in pursuing what he considers his own private and exclusive interest in whatever he likes best'.\(^{29}\) It is the totality of this selfish action which creates the impression of co-operation; once again, there are echoes here of Whately's influence.

The pursuit of self-interest leads to competition, and any attempts to allay its effects do nothing but interfere with the basic freedom of the individual. The tendency in history is for labour to move from the physical and unskilled variety to that which requires intelligence and skill; as society grows in bulk and complexity so the division of labour increases, a necessary part of the emergence of greater heterogeneity. What competition does is to allow the principle of natural selection to operate in industry. Just as in nature the weakest are eliminated 'so the feeble and unskilled tradesman falls before his superior competitor'. It is not simple analogy that is being alluded to here as the example Hearn goes on to elaborate shows:

It is not more certain that one species of rats or of cock-roaches has frequently expelled another such species ... than it is that the hand-loom weavers are disappearing before the power looms, or that the old stagecoachman has given way to the stoker.\(^{30}\)

Products or the means of production that are unfit are also eliminated by competition 'What death does in nature, insolvency effects in society'. In a direct reference to Darwin, Hearn says that 'of society as well as of organic nature, it may well metaphorically be said that natural selection is daily and hourly scrutinising throughout the world, every variation, even the slightest; rejecting that which is bad, preserving and adding up all that is good'.\(^{31}\)

The biological metaphors are once more in evidence when Hearn examines in detail the 'social contrivances' designed to promote

\(^{29}\) Ibid. 293-95.

\(^{30}\) Ibid. 341-47.

\(^{31}\) Ibid. 347.
organisation. In an early stage of society, trade is carried out in a rather haphazard way, through fairs and markets which are subject to irregularities. In the same way, the blood flow of the more primitive natural organisms tends to be irregular and lacking a single direction. In more advanced organisms blood flow is regular and uni-directional, just as in civilised life the irregularities of fairs and markets are replaced by the regularities of commercial markets and sophisticated communications.32

Hearn's most profitable use of the biological theme however comes in his chapter detailing the industrial evolution of society. Here Spencer's influence is at its greatest. In the individual, nutriment brings about greater complexity as growth proceeds along with continuing differentiation of parts. In true Spencerian fashion Hearn describes how the 'homogeneous structure gradually becomes heterogeneous, and the uniformity of function gives way to variety'. There is a division of labour between the parts of the organism, but there is nevertheless total interdependence and organisation. When we move from the individual to the group-species or genus-it is the complexity of organisms which decides their place in the natural scale. A similar growth in complexity and variety of special organs is observable, according to Hearn, in the evolution of industrial society, for in both cases there is an increase in bulk, structures become more complex and there is greater interdependence of parts. In the case of England for example, 'in the complexity of its several organs no less than in its actual bulk, the English nation exceeds an aboriginal tribe at least as much as one of the higher mammals exceeds a zoophyte'.33

Whereas among simple organisms such as worms injury often does little permanent damage, so in simple cultures disturbance has little effect because relationships between poorly organised and loosely structured groups are such that there is little sense of interdependence. Among the more civilised societies however, disturbance in any one part reverberates throughout the whole. As Hearn put it in one telling example, 'The insolvency of the capitalist throws the labourer out of employment'.34

32 Ibid. 360.

33 Ibid. 383-385.

34 Ibid. 385.
Continuing the Darwinian theme, Hearn asserted that man is subject to the same checks and balances as the rest of the natural world. Only in a truly complex community, where man takes some control over 'the primary conditions of existence', can he increase his numbers and, if he so chooses, decide when and how many offspring he could support. A large population, when well organised, and where the division of labour is great, is crucial to the industrial evolution of society for 'it is a good principle in the increase of organisms that the same space of ground can support a much larger amount of life if the species be different than it can if there be but a single species'. This example, which Hearn took directly from the Origin of Species, is used to throw light on human society. The 'most flourishing' populations are those where the number of different employments are greatest; industry, which has a greater division of labour than agriculture is a greater engine of social growth and development. According to Hearn, within industrial society the growth of specialisation is further evidence of advance. In early primitive societies, the 'myths of origins' were the province of the poet. With time this function was transferred to the philosophers, leaving to the poet the realms of entertainment and moral education, while philosophy itself eventually splits into numerous forms and science becomes the arbiter of knowledge about the material world. And, of course, science divides up into its own specialist areas; from the cosmogony of Thales we reach the highly specialised science of the present day, a picture which fits both the Comtean view of history and the Spencerian thesis that social development takes place as the homogeneous features of society become heterogeneous.

This development can even be observed in that most basic unit in the foundation of society, the family, which has been largely broken up insofar as there has been the growth of the notion of individuality, which implies freedom of action. That of course brings

35 Ibid. 392.


37 William Edward Hearn, op. cit, note 13, 393.

38 Ibid. 399-401.
Hearn's argument full circle; individuals act freely and in their own terms, selfishly, but as social creatures and in the wider context of society, their combined selfishness leads to the social good.

John La Nauze suggested that Hearn's claim to originality stemmed from his grafting of evolutionary theory onto political economy.39 This may not be putting the matter quite strongly enough; 'grafting' implies that Hearn added evolutionary theory to his ideas either as an afterthought or as a means of bolstering his position. In Plutology, evolutionary theory is a constitutive part of the whole, much as it was for Herbert Spencer. Like Spencer, Hearn accepted the thesis of progress and the strong sense of the analogy with biological theory encapsulated in the idea of the development of the heterogeneous from the homogeneous. Again, as it was for Spencer, social evolution was for Hearn a matter of demonstrable fact, a process under the control of laws as fixed as those which ruled the natural world. The major difference between the two related more to ontological questions; for Spencer the origin of this law-dominated process lay somewhere in the realm of the 'Unknowable', while Hearn seems never to have doubted that his theory of political economy and social evolution could be accommodated within his Anglican faith.

In two later books Hearn developed some of the ideas raised in Plutology. In The Government of England, its Structure and its Development, first published in 1867, he sought to show that political change was the result of a 'spontaneous growth of social forces', once again a clear rejection of the Whatelyan degenerationist position. The English Constitution, rather than being a creation of merely human forces, was in fact the result of evolutionary social processes 'one of the forms in which national life is manifested'.40 In the earliest period of English history, there was no 'very strict division of political function. Such a separation is the product of the characteristics of a later and a higher development'41 Understanding how the differences between the earliest period and the present evolved requires recourse to 'biological

39 John La Nauze, op.cit, note 12, 64.


41 Ibid, 387.
analysis' rather than the laws of physics, and answers to social questions 'must be sought for in the laws which regulate organic development. The changes which have taken place in our Constitution are the results of the natural process of evolution'. In modern industrial society there has been a great 'differentiation of public organs', each distinct but mutually dependent. According to Hearn, this development contrasts markedly with that evident in more 'unnatural' and 'unstable' forms of Government such as that associated with Imperialism, which Hearn equates with ancient Rome and modern Russia. The English Constitution exhibits 'spontaneous evolution, in which a homogeneous and simple body is by a series of differentiations and integrations transmuted into a heterogeneous and complex body'. Imperialism on the other hand is regressive because it centralises authority and places too much power in the hands of the State. It should not come as any surprise to discover that Herbert Spencer was said to have greatly admired The Government of England.42

In 1878 Hearn published The Aryan Household: its Structure and its Development. Denying any claim to be presenting a study bearing on the origin of man as such, Hearn concentrated on the development of the Aryan race, which is 'the foremost in the world'. It included most of the countries of Europe and India, where its origins could be traced. Curiously, he also rejected the idea that he was presenting a historical study, asserting that he was merely looking at the 'archaic' characteristics of its earliest period from which modern social institutions have developed. In that period, there was neither individual nor State, only clans, each made up of families each of which had originally been under the control of a 'House Father' and a strict scheme of rank43. The growth of the clan eventually led to further division until a group of clans came together to form new combinations out of which, ultimately, arose the State.44 Where in the earliest stage, society had been ruled by the rigidities of custom, social development led

42 See the entry on Hearn in Leslie Stephen, Editor, Dictionary of National Biography.


44 Ibid. 7.
to the reign of law. Hearn saw law as a code of behaviour but a flexible one setting parameters which allowed individuality to blossom. Modern society is political society, the only form where true individuality can develop. Clan society was dominated by group interest and each member was subsumed within that interest; modern society 'implies great aggregates of individuals living together under a central government'. Echoing the theme pursued in Plutology, Hearn pointed out that within the framework of the law as it has been elaborated, the individual is free to do as he pleases in modern society.45

He then returned to political economy, claiming that it was a 'true science, that is, that its phenomena may be traced to ultimate laws of human nature'. The conclusions of political economy are, like all sciences, universally true, but only when the correct conditions have been met in any given society.46 Put another way, only when society has reached a modern industrialised stage, can one apply the analytical tools of the science. In Plutology Hearn had rejected the idea that political economy was merely a descriptive art; in its true sense, it was prescriptive because, in detailing the processes of social development it pointed to a means of distinguishing the legitimate activities of the State from the illegitimate.

Assessing Hearn's work in terms of its role in promoting evolutionary theory in Australia is difficult. It does not appear to have raised the ire of the clergy nor inspired the sort of lively debate sparked off by Halford around the same time that Plutology was first published. On the other hand, the combination of political, economic and biological components helped frame for Hearn a generally conservative ideological position, supporting the laissez faire doctrines of free trade and minimal state interference in economic and industrial affairs. It is no doubt true, as John La Nauze has pointed out, that the bulk of Plutology was unoriginal, and that in many ways it was a restatement of orthodox political economy, but it was original to the extent that it depended for its effect, and to a large extent its validity, on a grounding in Spencerian metaphysics and Darwinian and social-evolutionary metaphors and analogies. In the social and political climate of nineteenth-century Victoria, it was a restatement made to create an effect; colonial

46 Ibid. 11.
administrations came and went, often on the basis of their attitudes to the protection of local industry and the deliberate use of tariffs to protect the jobs of workers. Hearn ensured that the free-trade position received a fair hearing, by associating himself with the Argus, a long time opponent of protection, and by setting Plutology as a text for his courses at the University. With hindsight, it is possible to see that the free-trade forces failed to gain the upper hand and that this was largely due to the power and influence of a trenchant critic of both Hearn and Darwin, David Syme. In the contrast between the positions of these two men can still be seen the undercurrent of evolutionary thinking that flowed through what were otherwise technical and political questions and answers relating to colonial life in Victoria.

DAVID SYME: LIFE AND WORK

David Syme was born in Scotland in 1827. After spending some time in Germany as a student in 1849, where he 'imbibed Liberal views', and unsuccessfully joining the great California gold rushes in 1851, Syme came to Australia in 1852, prospecting on the Victorian gold fields before joining his brother Ebeneezer as a partner in the Age newspaper. After briefly abandoning the paper he returned to it in 1859 and, on Ebeneezer’s death a year later, took over full editorial and publishing control, which he maintained for the next fifty-one years.47

The Age waged a constant battle with Edward Wilson’s Argus for press dominance in Melbourne; the feud between Syme and Wilson, alluded to in Chapter 3, was bitter and often personal and the two newspapers rarely agreed on any issue. Some of the most bitter disputes were centred around the question of protection for local industry, with the Argus promoting the free-trade interests in the colony and Syme using the Age to push the protectionist cause. It was this dispute more than any other, which brought Syme into conflict with Hearn. Like Hearn, Syme published four books, and John La Nauze has pointed out that two of them 'might almost seem to be answers' to Hearn.48 Outlines of an Industrial Science, published in 1876 is his most


48 John La Nauze, op.cit, note 12, 100.
lengthy statement on political economy and is clearly designed to
counter the laissez-faire claims made in Hearn’s *Plutology*. In 1881
Syme published *Representative Government in England*, a plea for wise
legislation and a counter to the conservative position expounded by
Hearn in *The Government of England*. Syme’s last two books are not
directly related to anything Hearn wrote but are of great interest
because they deal explicitly with evolutionary themes and in their own
way bolster Syme’s critique of the social and economic positions
represented in the colony by Hearn. In 1892 appeared *On The
Modification of Organisms*, a critical attack on Darwin, especially the
theory of natural selection. Thirteen years later the *The Soul: A Study
and an Argument*, which extended the views expressed in the earlier
work including his view of the process of evolution, was published.

Like Hearn, Syme was successful in getting his work
reviewed overseas. His first book was used as an introductory text on
political economy in America, where a separate edition was published.49
His critique of Darwin raised the ire of no less a person than Alfred
Russel Wallace, which led to a short and intemperate correspondence
between the two men in the pages of *Nature*. (see below)

In *Outlines of an Industrial Science* Syme set out his views
on political economy. In essence, the book was a defence of his belief in
the validity of Government involvement in economic affairs, especially
where this concerned the protection of local industry. By necessity, and
probably by design as well, it was a refutation of the views put forward in
*Plutology*. Why, asked Syme, should political economy deal exclusively
with wealth; it was a poorly defined term and in any case there was no
reason to believe that investigating the supposed laws of the production
and distribution of wealth would give an accurate picture of what social
relations were really about.50 According to Syme what was needed was
an ‘Industrial Science’ which investigated the laws which regulated
human industry; that is, it should concern itself with processes not
results. Classical political economy (which at various times Syme called
‘modern economics’ or ‘English economics’) was basically deductive,
based on supposedly self-evident propositions such as that ‘every man

49 Ibid. 11.

desires to obtain additional wealth with as little sacrifice as possible. It is this picture of the selfish individual as the fundamental social unit which Syme took greatest exception to. All men, he claimed, have a variety of motives for the actions they take; if only one dominated, as the classical economists asserted, then there was no possibility of building cohesive social units. Syme was particularly annoyed by the Whatelyan view that 'the purely selfish man is a benefactor to his species in spite of himself.' As will become clear, Syme's own view of a beneficient social system was based on far more elaborate grounds. It was self evident to Syme that all men share motives of sympathy, charity, filial loyalty as well as a broad altruistic instinct, and the interplay of these often worked against the interest of the individual but were essential to the interests of the wider society.

Differing at this most fundamental level from his opponents, it is not surprising to find Syme at odds with them over the role of competition in social and economic affairs. He quoted Hearn as saying that competition is 'beneficient, just and equalising', its operation a law as fixed as gravitation, but found the claims wanting. All the available evidence suggested that competition led to monopoly and hence higher not lower prices; there was no pure competition in the real world, where large capitalists inevitably overcame 'the man of small means' by dint of financial power, not competitive edge. Syme granted that it might have been the case that, in an earlier period of human history, competition between individuals was the rule; but while the struggle for existence may be the rule in nature, in society there is strong parental and filial feeling. In no sense could a collection of selfishly impelled individuals form a truly social group; it is the moral code which dictates social behaviour and which gives cohesion to the social organism.

51 Ibid. 13.
52 Ibid. 23-32. Syme refers to Whately directly in a footnote on page 31
53 Ibid. 23
54 Ibid. 55-60.
55 Ibid. 90-91.
According to Syme, the forces that produce industrial phenomena can be divided into three groups. The Egoistic is concerned with the sensations centred around the self; the Hemeistic are concerned with the gratification of social emotions and the Allostic are concerned with justice and duty. The first group he subdivided into wants, which deal with the basic and universal demands of survival, and desires or 'acquired wants', which are not necessarily universal and therefore may vary from culture to culture. Syme accepted the view of one school of thought which believed that the most civilised societies are those which produce and consume more, that is, which 'have the greatest number of artificial wants'. Because man is by nature a social creature, his behaviour is largely shaped by his social relations, which constitute the Hemeistic forces. In the Allostic group, duty and the sense of justice may lead to actions such as paying or rescinding debts, which go directly against the Egoistic desire found in the first category but which have wider social value.

Syme shared with Hearn the belief that society could best be understood as an organism, but consistently rejected the idea that any collection of selfish individuals could congregate to form a cohesive social group. For Syme, the individual has, as part of his nature, a tendency to aggregate, firstly into family units which train the individual for duty, and then into the wider society. The family sympathies develop into social sympathy, which in its collective sense creates public opinion and charity. This was not altogether an original position, for earlier economists such as Adam Smith and philosophers such as David Hume had based much of their moral philosophy on sympathy. (see Chapter 7 for a discussion of Smith's moral philosophy in relation to another Australian writer Alexander Sutherland) In his later, more explicitly evolutionary, books Syme returned to the theme of 'aggregating units' when detailing his theory of cellular consciousness as the dominant factor in bringing about biological change, once more illustrating the interconnectedness of social and biological discourse.

56 Ibid. 106-10.

57 Ibid. 113.

58 Ibid. 157-65.
It follows that from these basic beliefs Syme would view industrial society as being based on a strong ethical foundation; at its simplest this is seen when commercial contracts are drawn up or when private property is respected. The proper understanding of industrial society depends on a study of ethics, sociology and 'industrial science', each of which is intertwined with the other, and each of which is part of one whole science of man. Not surprisingly, Syme does not accept the view of the classical economists that Governments need listen only to advice from their kind when framing legislation. There are wider interests than those of 'selfish men'. Moreover, Syme believes that it is perfectly correct for Governments to intervene on behalf of those interests, for that which is 'good for all, and not merely for an individual or a class should be undertaken by the State; what benefits only a few should be left to private enterprise'.

In *Representative Government in England: its Faults and its Failures*, Syme continued the plea for flexible Government structures which could play a role in framing progressive legislation. What Hearn admired as the stable and gradually evolving English Constitution, Syme dismissed as a slow, cumbersome and inadequate structure in which 'reforms have come by instalments rather than in the lump'. He found no evidence in the historical development of the English Constitution to support the view that it changed gradually, always adapting itself to the particular period without losing its fundamental roots. And where Hearn saw legislation as at best a necessary evil, often misguided and consequently a hindrance to human progress, Syme saw it as a progressive feature of society.

The differences in approach can be simply put because the two men shared only the belief in the organic nature of society. Its origin and development were a very different matter. Hearn's explicit alignment of classical economics with a mixture of Spencerian and Darwinian evolutionary theory provided Syme with a large target. In 1890 he published *On The Modification of Organisms*, a critique of Darwinism and an outline of Syme's alternative theory of evolution. The

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59 Ibid. 174-85.

connection between this book and Syme's earlier works may at first seem slight, but his contemporaries were not slow to see that there was a connection. As one anonymous reviewer said at the time,

>'Having rejected free-trade and the competition of brute forces like greed and want as an adequate motive for the development of Society ... [Syme] proceeds in this volume to combat the theory of natural selection, the extermination of the unfit and the selection of the appropriate as sufficient to explain the origin of species, and the psychological as well as the physiological unit.'\(^{61}\)

At the outset it ought to be said that Syme's critique of Darwin was often based on a misunderstanding of basic terms such as natural selection, and often, a misunderstanding of the intention that lay behind Darwin's use of such terms. This can be seen, for example, when Syme claims that natural selection is just another name for the struggle for existence; and, again, when he criticizes Darwin for equating natural selection and survival of the fittest, which Syme sees as a confusion of cause and effect.\(^{62}\) This proved to be an unfortunate move on Syme's part as it was seized on by a reviewer with impeccable credentials for responding to it. When Wallace reviewed the book in *Nature*, he dismissed it as a rather outdated and misleading work in which Syme had played fast and loose with the text of the *Origin of Species* in order to discredit its author. Syme rather unwisely, perhaps, responded to Wallace's charges, at which point the co-discoverer of natural selection got down to serious business, quoting sections of Syme's work which showed clearly that it was an unsound exposition of Darwin's ideas to say the least.\(^{63}\) Syme had claimed for example that Natural Selection did not create favourable variations and was 'neither creative, preservative, nor greatly destructive' and far from being beneficent, as Darwin had claimed, it was 'on the whole pernicious and tends to produce disease, premature decay, and general deterioration of all

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\(^{63}\) The dispute can be found in *Nature*, volume 43, no.1119, April 9, 1891, 529-30 and volume 45, no.1150, November 12, 30-31.
beings subjected to its influence. Darwin had of course gone to some lengths himself to insist that natural selection did not create the favourable variations that appear among individuals of a population, but by acting upon those chance variations over considerable periods of time produce great changes in the original population. As an example of the inability of natural selection to create anything Syme pointed to animals that have seasonal changes in plumage or fur. If natural selection worked to bring about one colour how could it do the same for the other; both clearly were of advantage to the animal concerned but at different periods in its life. Syme never seems to have understood that the Darwinian answer might be that selection would, in this instance, have worked on the capacity to change colour rather than what might be termed the outcome of the process, the particular colour itself. More seriously, as Wallace pointed out, Syme gave a misleading impression of Darwin's ideas by omitting key words from phrases of Darwin's, which often changed the context and the meaning.

Syme extended his critique to the theory of sexual selection and mimicry: the first he was prepared to accept as accounting for the bright colouring and elaborate structures of some males. However, he rejected sexual selection as inadequate to account for the size and the strength of the male, which he believed to exist for the purpose of dominating the females rather than for competing with other males. The Darwinian explanation for mimicry he dismissed on the grounds that it was too complex a solution to the problem; it was simpler to assume that when creatures adapt to their surroundings by taking on its colour or shape they did so deliberately and thereby showed a natural intelligence. This claim later became part of Syme's proposed solution to the larger problem of the origin of species.

64 David Syme, op. cit, note 62t, 18-19.
65 Ibid. 22-23.
66 Ibid. 12, 102, 100 for examples. Syme also constantly mistitles Darwin's book The Variation of Animals and Plants under Domestication as Plants and Animals Under Domestication, and refers to Romanes's book Mental Evolution in Animals as Mental Evolution of Animals.
67 Ibid. 60-63.
68 Ibid. 158-59.
It is clear that Syme did not thoroughly understand Darwin's theory, and consequently misrepresentations occurred throughout his discussion. At one point, commenting on Darwin's discussion of cross-fertilisation he mentioned flowers which 'have a narrow, elongated nectary, or a long tubular corolla, sometimes with hair inside which prevents the admission of any accept the smallest, and from the Darwinist point of view, the most useless kinds of insects'. He failed to point out that the first part of this statement came directly from Darwin while the second part is an inaccurate representation of Darwin's intention. Darwin says only that 'certain kinds' of insect are excluded by the described apparatus. There is no clear reason advanced by Syme to show that small insects are useless to the Darwinian. Perhaps the most serious case of misrepresentation occurred when Syme complained that the Darwinists made no mention of counter cases or cases that go against their own theory. He listed a number of such cases but made no mention of the fact that they are all taken from Darwin's own work.

SYME'S THEORY OF EVOLUTION.
If Syme's attack on Darwin was less than impressive, his own theory of evolutionary change had the merit of being put with some clarity, if little real originality. He began from the position that the organism works with its environment and purposefully seeks to adapt itself to any changes that arise. As Syme points out, this is not Lamarckism, for while Lamarck uses the wants and efforts of the organism as a whole to explain evolutionary change, his own theory depends on wants and efforts present in each cell of the organism; purposeful behaviour can be witnessed in the workings of a single cell, and organisms are in essence collections of cells. The cell then is the 'irreducible vital energy'; it feels,

69 Ibid. 87.

70 Ibid. Darwin's words can be found in his book, *The Effects of Cross and Self-Fertilization in the Vegetable Kingdom* (London: John Murray, 1876), 382.


72 David Syme, op. cit, note 62, 142.
thinks, and importantly, wills. But it does this not because there is some vitalistic principle imposed upon it but because it is in fact the cell which is the expression of life itself. That is, the cell has a material and a psychic aspect. In a neat if somewhat dubious analogy, Syme asserts that the cells combine together to make the working whole - the organism - in the same manner in which individuals in the social community pool their wills and experiences to create public opinion or national conscience. Note that this analogy finds its origin in Syme's work on political economy, (see note 57). Collectively, cells have a double function - their material composition guides the organism's day to day existence, while in combination they give the organism its Ego and its spiritual element, the Soul, which ensures that the internal relations of the organism are maintained by directing the parts to make a functioning whole.

The evidence for most of this is analogical. Syme details the apparently purposeful behaviour of simple organisms in seeking food, the maternal instincts of the lower creatures and the capacity of some organisms to restore lost organs according to a fixed pattern, to argue for a purposive power in nature. It quickly becomes clear why he was so determined to undermine the Darwinian program - it was based on a purposeless nature in which fortuitous variations are acted upon by a blind process of natural selection. It is a system in which the organism is at the mercy of the environment and to Syme that is repellant. For him, the gaudy caterpillars which take on the appearance of their immediate surroundings do so not as the result of a trial and error process of natural selection but because they quite literally choose to. That this choice extends down to the lowest cellular level is for Syme no more remarkable than that 'a lowly organised cold-blooded animal should have the power of restoring lost organs, while the more highly organised warm-blooded animals do not possess it, or only to a very slight extent'.

73 Ibid. 142.
74 Ibid. 150-53.
75 Ibid. 155.
77 Ibid. 140.
In his last book, *The Soul: A Study and an Argument*, published in 1903 when he was over 70, Syme elaborated on his evolutionary ideas. There he explicitly rejected the view that the brain was exclusively the seat of mind; rather, he saw it as the co-ordinating centre for all the nerve centres of the body. Each area of the body had its own centre of feeling. When we prick a finger we experience the pain caused, not in our brain but at the point of the wound. Syme believed that this sort of evidence suggested that the bodily sensations believed to be associated with mind were distributed throughout the body; this would explain experimental data such as the actions of a decapitated frog striving to remove acid dropped on its thigh. It must feel the pain at the point where the acid was present, because it has no brain to feel for it in any other way. Using one leg to attempt to remove the acid showed feeling, perception and volition according to Syme.78

The cerebrum as described by Syme was rather like a telephone exchange, co-ordinating activities but also deciding what is good for the whole organism, while the nerve ganglia distributed at other points in the body played more localised roles. Overall, Syme appears to have viewed the organism as a colony of purposive cells which exhibit a sophisticated division of labour in pursuing their combined goals as represented in the total organism. The analogy with society is quite explicitly made, for, 'There are subordinate nerve centres, and there is a supreme nerve centre, just as there are local centres and a supreme centre in the social organism'.79 In real terms, Syme was rejecting the distinction between mind and matter when dealing with living organisms; mind, 'Soul' as he termed it, was an intrinsic part of the make up of life, not a force added to it nor some epiphenomenon cast off by it.

The evolution and development of living organisms is, thus, the result of effort and experimentation on the part of those organisms themselves, 'Wants and efforts are the real factors in organic modification'.80 Again, it needs to be stressed that because these wants


79 Ibid. 45-48.

80 Ibid. 106.
and efforts occur at the cellular level as well as at the level of the individual organism the similarity with the Lamarckian doctrine is more apparent than real. Although Syme does not refer to the work of Samuel Butler, there are similarities with Butler's evolutionary theory in that the teleological aspect that both men wished to put back into the biological sciences was now seen not in terms of ultimate purposes but in the responses to immediate wants by the organism itself, the cumulative effects of which brought about evolutionary change.\footnote{For a brief discussion of Butler's work see Peter J. Bowler, The Eclipse of Darwinism: Anti-Darwinian Evolution Theories in the Decades around 1900, (Baltimore: John Hopkins, 1983), 72-75.} Both Butler and Syme attributed to the basic particles of life the ability to influence the life of the organism. Butler made 'unconscious memory' the basis of heredity while Syme assumed that cell division was sufficient to pass on the psychical and material elements because each individual cell has a psychical component and 'in cell division each half of the divided cell is exactly alike, and so the qualities of the original cell are necessarily transmitted to the cells produced by division'.\footnote{David Syme, op.cit note 77,15.} But the willing and designing organism is not perfect; it makes mistakes, and the advance of life shows that it learns from those mistakes. As a consequence, Syme makes no claim for the total process of evolution itself showing evidence of beneficent design or that organisms modify themselves 'according to a preconceived plan, or [that they] ... have a clear idea of a purpose'. However the provisions that allowed for the origin and existence of life in the first place bespeak a Higher Power.\footnote{Ibid. 110-11 and 136.}

When Syme turned his attention to the question of mental evolution he brought his ideas on biological and social theory together. He envisioned the process of mental development as occurring in three stages. In the first it is the 'vital processes' that predominate; these are possessed by all organisms and are the basic processes of survival. They are distributed through all the cells, and from them develop, in the second stage, the instincts which are the result of heredity and which are centred in the ganglia.\footnote{Ibid. 173ff.} The higher mental processes take place...
only in the brain, and so require that an organism has reached a high state of complexity before they come into play. Armed with this theory Syme tackled the deeper issues of existence, including the question of survival after death. If living organisms are a complex of matter and spirit then what is it that actually dies? The suggestion that the physical environment must have been originally prepared for living matter by some Higher Power, left the way open for the belief that 'spirit' pre­exists matter. While matter clearly perishes at death there is no reason to believe that spirit goes the same way and Syme's belief is that the Soul survives in some way.85

Syme's persistent use of social analogies and metaphors is no accident. The industrial society which in his first book he described as being at its highest 'when it has the greatest number of artificial wants' foreshadows in a logical and natural way his biological theory. That biological theory itself is a response to a 'want' on Syme's part, namely, the desire for a natural corollary for the sort of social organism that displayed not the cut and thrust of individual competitive struggle but the smooth workings of an integrated society. Social harmony did not preclude the individual members from 'interfering' with its running when to do so would benefit the wider community, just as in the organism, adjustment to changed conditions is a necessary function of the life force present from the cell up. As the living cells must, in complex organisms work interdependently, so in society the members must accept the division of labour and work toward the common good of social health and well-being. Clearly, this downgrades the role of the 'selfish man' of classical economics just as it downgrades natural selection at the organic level from having any role in furthering the development of the organism. At no stage must society be in such a state that social division and conflict are the rule; Governments must control society. 'We may compare the system of the natural division of labour to the relations existing between the Premier and his colleagues under responsible Government - the Premier is the 'Ego', the personality, the ruling power'.86

85 Ibid. Chapter VII Transformation', 177-206.

86 Ibid. xii-iii.
CONCLUSION

In a recent analysis, Stuart Macintyre has argued that David Syme was one of a group of influential thinkers who brought into being a specifically local brand of 'colonial liberalism'. The core of what was new in this re-interpretation of a dominant ideology lay, in part, in the demand that local industries be protected by legislative means; the classic Liberal tenet of free-trade, economic dogma from Adam Smith to John Stuart Mill, was considered unsuitable for colonies striving for economic independence. In the wake of the gold rushes of the 1850s, Victoria's population had burgeoned. To free the colony from dependence on imports of manufactured goods and to ensure that it was not laid open to the voracious appetite of Imperial capitalism, Syme and his disciples Alfred Deakin and George Higginbotham worked to ensure that the colonial governments of the day took the protectionist course. By the 1880's Syme's power as a newspaper proprietor was such that he could make or break such governments.

For Syme, governments were the visible part of a cohesive social organism; if it took legislative measures to ensure the smooth workings of that organism and if those measures meant abandoning the dogmas of classical liberalism, then so be it. To suppose that the selfish drives attributed to human nature by the classical economists could alone develop and sustain social cohesion seemed to Syme a nonsense.

For Hearn, the entry of the state into social affairs, outside of a very narrowly defined sphere of legitimate interest, was no less than interference, an unnatural intrusion stifling the individual endeavour which was the only basis upon which a healthy social organism might thrive. The fact that both men, implacably opposed on this crucial question being asked within the colonial culture of Victoria, should seek to 'naturalise' their respective arguments by appealing to principles of biological development illustrates the power which scientific interpretation displayed in the wake of a general acceptance of theories of progress and evolution. The move from the biological to the social seemed both logical and necessary whether the social philosophy being urged represented traditional or non-traditional thought. For Hearn, acceptance of a narrowly defined Darwinism, where competition and selection in nature was matched by the same principles in society, and

which conferred the same kind of benefits (again narrowly defined) on the social organism, allowed for a richer and more scientifically satisfying legitimation of classical economics. Traditional values were maintained; providence secured through the power of natural law, and social development justified and explained.

For David Syme, the central tenets of Darwinism were inadequate to explain social behaviour (and ultimately biological development as well). Political economy, narrowly interpreted as the selfish pursuit of wealth and individual success could not adequately account for social life or its development. The social organism, like the biological organism, was dependent on the healthy working of all its parts, not on competition between them. Disrupt one of the parts, be it connected to labour or capital, and the whole ceases to function smoothly or to its maximum benefit.

The interaction of biological and social theory in the thinking of Hearn and Syme is at one level simple to comprehend. Both were adept at using biological metaphors to explain social phenomena, and such metaphors abound in their respective writings. But beneath this use of metaphor lies another level, where legitimation of social philosophy depends on the naturalising of arguments. At this level science and philosophy are merged, political positions become scientific fact and opposing viewpoints the subject of scientifically formulated criticism. In the social context of nineteenth-century Victoria, local issues, including the legitimate role of government in economic life, determined debates carried on under the larger banners of evolution and progress. What was at stake - though the participants could hardly have known it - was no less than the political and economic agenda for the first century of federated Australia.
CHAPTER 6

DARWINISM, SOCIAL DARWINISM
AND THE AUSTRALIAN ABORIGINES

Two propositions will be argued in this chapter. Firstly, because recent scholarship suggests that the traditional distinction drawn between Darwinism and social Darwinism is historically untenable, there is a need to re-evaluate the manner in which scholars have deployed these terms when analysing the history of race relations in Australia. Secondly, this re-evaluation will lead to a reassessment of the way in which Australia's contribution to evolutionary anthropology has been perceived. Far from being merely a quarry to be mined for value-free and ideologically untainted ethnographic resources, Australia was an exporter of information in the human sciences which was tightly constrained by a set of social values and political ideology.

Historians have often commented on European settlers' use of Darwinian rhetoric as part of the agenda for justifying racial supremacy and land dispossession in Australia. They have sought to make sense of that rhetoric by applying to an Australian context a series of propositions widely accepted as part of nineteenth-century social theory and political ideology. Although rarely spelt out in detail, these propositions invariably focus on the supposed misapplication of Darwin's biological theory of evolution by natural selection (with all its metaphorical allusion to struggle, fitness and survival), to social development and racial fitness. Since Richard Hofstadter's pioneering study of social Darwinism in America was first published in 1945 the concept has been taken to apply to two areas of study. On the one hand, it has been used in the analysis of right-wing, individualist philosophy, and on the other, in understanding


the spread of European imperialism in the second half of the nineteenth-century.

It is in the second sense that Australian scholars have applied the concept when detailing the tragic consequences of the collision of European and Aboriginal cultures. In essence, they have seen social Darwinian rhetoric as part of a conservative ideology invoked to uphold the claims of a pastoral elite in their struggle for land and political power. Bernard Smith for instance, in his Boyer Lectures for the Australian Broadcasting Corporation in 1980, said that Darwin’s theory of natural selection

was a biological theory ... It offered no explanation except by analogy for social change. But in the hands of popularisers of the theory of natural selection such as Herbert Spencer, social analogies were seized upon. A man with a gun was fitter to survive than a man with a spear; the murderer was fitter than his victim.3

The invocation of Spencer’s name has long been part of the established demonology of scholars of social Darwinism; to Spencer is usually attributed the perversion of the pure Darwinism said to be expounded in the Origin of Species. Defending that supposed purity has been the occupation of many historians of biology in the past century, and the historical waste-can of social Darwinism has proven to be a popular receptacle for all the ideological impurities found at the door of Spencer and his friends.4

In recent times there has been a decided shift away from the Hofstadter line outlined above. In the 1960s, Robert M. Young suggested that both the form and content of Darwin’s theory were dependent on a complex collection of social and cultural ideas that existed as part of the


4 See for example Ernst Mayr, The Growth of Evolutionary Thought, (Massachusetts: Harvard University Press, 1982), 386. 'Spencer’s ideas contributed nothing positive to Darwin’s thinking; on the contrary they became a source of considerable subsequent confusion ... Worst of all it was he who became the principal spokesman for a social theory based on a brutal struggle for existence, misleadingly termed social Darwinism'. Mayr gave Hofstadter for his source. A somewhat softer line is taken by Michael Ruse, but the same element of blame is evident when he asserts that These various doctrines [associated with social Darwinism] owed as much to Herbert Spencer as to Charles Darwin, if not more'. Ruse does go on to point out the ambiguity evident in Darwin’s writings when it came to the application of natural selection to man, see The Darwinian Revolution, (Chicago: University of Chicago Press, 1979), 264-65.
dominant ideology of nineteenth-century Britain. In particular, Young pointed to the work of political economists such as Adam Smith and Thomas Malthus, which along with the natural theology of William Paley and the psychology of Dugald Stewart helped create a common context of intellectual life in which Darwin was situated. Young's attempt to show that, as he later termed it, 'Darwinism is social', was extended by the sociologists Barry Barnes and Steven Shapin in a provocative paper published in 1979. They argued that the purported purity of Darwin's theory was in fact an artefact created by historians for the purpose of distinguishing the legitimate domain of Darwin's biology from its illegitimate extension to social theory and political philosophy. In 1986 the historian James Moore brought together these ideas, and through the simple expedient of looking at what Darwin actually said about man and his biological and social history made the point that the distinction between Darwinism and social Darwinism would have been lost on Darwin himself. As Moore makes clear, both the Descent of Man and the Expression of the Emotions resonate with supposedly social Darwinian terms and expressions and Darwin showed no reluctance to apply the findings he put forward in the Origin to human development, physical or social. Put briefly, the revised view of Darwin's own attitude towards the application of his theory of evolution by natural selection to social affairs suggests that he would not have seen the distinction between the social and natural realm as having much, if any, validity. As Moore makes clear, it was all of a piece in his thinking, an integrated whole.

This revision of what may be termed the standard view has opened the way for a re-evaluation of the use of Darwinian theory in the context of nineteenth-century Australian history. If, after all, there is no clear distinction between Darwinism and Social Darwinism then the type of comment made by Bernard Smith is based on a misconception and must be


rejected. Further, the work of Young, Barnes, Shapin and Moore has made it possible to look again at the manner in which Darwin used resources to construct his theoretical picture of human biological, social and cultural development. Australian material played an important role in that process, but with the insights provided by the re-evaluation of the scholarship in the area it is possible to go beyond merely listing and cataloguing those resources and ask the question: to what extent were Australian anthropological materials already framed within an ideological context which could be slotted into a Darwinian view of human physical and social evolution?

BEFORE DARWIN: IDEOLOGY, RACE AND THE ETHICS OF CONQUEST.

The settlement of Australia after 1788 quickly led to conflict between the European invaders and the native aboriginal population. Despite occasional protests from the British authorities there was little local pressure to come to a peaceful arrangement between the conflicting cultures. The spread of pastoralism, from the 1820s on, saw the emergence of what might be termed a myth of legitimation, designed to justify the appropriation of the land from the Aborigines. In 1849 the prominent pastoralist James Macarthur expounded the essential features of this myth when declaring that 'the worthless, idle Aborigine has been driven from the land that he knew not how to make use of, and valued not, to make room for a more noble race of beings, who are more capable of estimating the value of this fine country. Is it not right that it should be so?'

Macarthur's vision of the onward march of civilisation represented by hard working Europeans destined to supplant a primitive, unreflective race of natives, was neither original nor unusual. It was based on a long and continuing tradition in British social thought. John Locke had elaborated the view that unused land could be colonised, and down to the present day unused has meant not brought within the confines of European modes of agriculture and pastoral use.

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Using land in the traditional Aboriginal manner - usually for hunting and gathering - counted for little when judged against the cultural values of the European invaders of Australia. In the 1830s the Sydney Morning Herald berated as obstacles to progress the defenders of the native population for 'it is the right of civilised men to occupy country in a state of nature ... if this were not so the great end of civilisation could never be effected'.\(^\text{10}\) Bernard Smith quotes a commentator in 1847 as saying 'Regret concerning the disappearance of the Aborigines is hardly more reasonable than it would be to complain of drainage of marshes or the disappearance of wild animals'.\(^\text{11}\) Smith describes this attitude as the ethos of the pastoral life, the outcome of distorted cultural values, while Michael Roe terms it 'the squatter theory of value'.\(^\text{12}\) Implicit in this fundamentally ideological position was the belief that Aboriginal culture, judged from a European perspective, was primitive and destined to disappear. Smith and the historian Henry Reynolds both emphasize the functional aspect of this ideology which in Reynolds words 'cleared the conscience just as the superior arms of the whites cleared the land'.\(^\text{13}\) But Smith's point that it was the result of distorted cultural values brings the issue closer to the interests of this chapter. While Australian culture was largely a dependent one, in a frontier, rural and agricultural environment, imported ethics were transmuted; Enlightenment ideals of the equality of man were lost sight of, and necessity led to the invention of an ethical system more congenial to the colonists' needs. Conquest, and the takeover of Aboriginal lands, was increasingly justified by invoking a set of social values based on utilitarianism and a work-ethic based on a growing belief in social progress. Smith convincingly argues that this ethic was home grown, an original Australian construction, albeit built on elements drawn from political and social philosophies devised elsewhere.\(^\text{14}\)

The assumption that the Aborigines belonged to an inferior race which must inevitably disappear when confronted by a 'superior' one was popularised in the writings of explorers and naturalists in the early

\(^{10}\) Quoted in Michael Roe, op. cit, note 8, 27.

\(^{11}\) Quoted in Bernard Smith, op. cit, note 3, 17.

\(^{12}\) Bernard Smith, ibid, 15-16; Michael Roe, op. cit, note 8, 67.

\(^{13}\) Henry Reynolds, op. cit, note 1,104.

\(^{14}\) Bernard Smith, op. cit, note 3, 17 - 18.
decades of the nineteenth century. The botanist Alan Cunningham, for instance assured readers of his published journal that the natives were 'at the very zero of civilisation, constituting in a measure the connecting link between man and the monkey tribe' 15Written in 1834 these words seem to presage a later Darwinian attitude, but in reality they probably refer back to the old notion of the great chain of being where racial hierarchies were accepted as part of an ideal set of relationships emanating from divine thought rather than as real genetic affinities. While there was some protest against the type of thinking characterized in Cunningham's description, it was clearly in line with the interests of the majority of Europeans.

Other historical and cultural factors were also involved in the process of classifying the Aborigines. Bernard Smith points to the role of the Biblical myth of the separation of the races as the guiding metaphor of pre-Darwinian racist ideology, but of increasing importance was the influence of scientific ideas, especially those associated with the rise and development of phrenology. 16Henry Reynolds quotes the important British publicist for phrenology, George Combe, as saying that the Australian Aborigines had great deficiencies in the moral and intellectual organs and therefore were unsuited for and indeed incapable of civilisation. 17Phrenology seems to have been something of a fascination for the early explorers of Australia. The naturalist George Bennett complained that the Aborigines distrusted his attempts to administer phrenological tests, which they apparently took to be a form of witchcraft, 18while Charles Sturt and John Lort Stokes applied phrenological principles when attempting to describe the Aborigines' physiognomical configuration for their readers. Stokes, who was usually well disposed towards the natives painted a particularly menacing picture.

15Quoted in Henry Reynolds, op. cit, note 1, 110.


17Henry Reynolds, op. cit, note 1, 115.

18George Bennett, Wanderings in New South Wales, Batavia, Pedir Coast etc. (London: Richard Bentley, 1834), 242 - 243.
They have very overhanging brows, and retreating foreheads, large noses, full lips ... The unfavourable impression produced by their physiognomy is confirmed if their phrenological conformation is taken into consideration; and certainly if the principles of that science are admitted to be true, these savages are woefully deficient in all the qualities which contribute to man's moral superiority. 19

Sturt agreed with this analysis but made the somewhat ambivalent remark that 'in a savage state the higher intellectual faculties ... are seldom called forth'.20 In the 1850s the Victorian Colonial Government took evidence from a phrenologist who declared the Aborigines to be 'beyond permanent improvement ... the sides of the forehead offer the greatest possible contrast with the Grecian or artistic skull'. 21 The first science of man thus achieved a degree of official recognition in the Australian colonies, but more importantly it provided scientific support for an ideology congenial to the invading European culture. Phrenology explained why the native population did not use the land or show any inclination to, and it did this by entrenching that explanation in a strongly deterministic biological theory. When Darwin visited Australia in 1836 he found the ethic of conquest firmly ensconced in the ideology of colonial expansion. And it did not remain within the confines of the Australian colonies. In Britain and Europe the journals and accounts of Australian explorers, naturalists and pastoral settlers were widely read, and with few exceptions these carried the message that the Aborigines were a low and doomed race. One cynical commentator quipped at the time that 'the recipe for an Australian novel was a quick read through Stokes, Grey, Sturt and Eyre followed by a quick visit to the Royal Gardens at Kew for a quick review of Australian plant life'.22 It might, with equal validity, be said that precisely the same ingredients went into the creation of scientific knowledge about the Australian continent, including its human inhabitants.


The best of the explorers' accounts often exhibited an ambivalence towards the natives. Sturt wrote in the early 1830s that he doubted whether they had any idea of a 'superintending providence', which in the context of the time was a clear sign of savagery, and added that he believed them to be at the bottom of the scale of humanity. Some years later, with the benefit of more direct experience, he altered his opinion, suggesting that they should not occupy 'so low a place in the scale of human society as that which has been assigned to them'. Against the trend of current opinion, Sturt went on to point out that it was the culture of the Aborigines and not their biological makeup which presented the chief obstacle to their becoming fully civilised. Sturt's Journal remained unpublished for more than a century, robbing potential readers of the benefit of his mature and revised reflections on the nature of the Aborigines. Thomas Mitchell agreed in the main with Sturt, explaining the decline of the natives as being due to the encroachments of pastoralism and the disappearance from the traditional hunting grounds of the staple food, the kangaroo. Such straightforward observation-based explanations were in the minority, however. Increasingly, the trend was towards attributing the low status and poor prospects of the Aborigines to fixed biological laws. Representative of this view was Paul Strzelecki's explanation of the ill effects of interracial sexual union on the fertility of Aboriginal women. According to Strzelecki the inferior native breeding was incompatible with that of the superior European. George Bennett, pushing the phrenological case to its logical conclusion, quoted the French scholar, Lesson, to the effect that 'judged by external appearances and intellect [the Aborigine] has been degraded from the true rank of man and approaches the nature of the brute'.

In summary, then, there are good reasons for believing that long before the appearance of the *Origin of Species* the prevailing image of

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27 George Bennett, *op. cit*, note 18, volume 1, 171-172.
the Australian Aborigines among the European settlers was that they were biologically ill-equipped to sustain their lifestyle and culture in the face of an invasive 'superior' race and culture. According to Henry Reynolds, Darwin contributed a dynamic aspect to this picture, providing a naturalistic law to explain Aboriginal inferiority. While no doubt correct, there is an element missing from this account. Before Darwinism became part of the process of legitimization for colonial expansion in Australia it was itself informed by the image of the Aborigines described above. There is thus a fascinating feedback process at work which casts doubt on any attempt to interpret the relationship of Darwinian theory to social theory as one of the simple, additional input of science into prevailing social and political ideology.

DARWINISM AND THE ABORIGINES
Fortunately there is direct evidence of Darwin's own appreciation of the nature and status of the Australian Aborigines. As his Journal of Researches shows, he thought them higher in the scale of humanity than the inhabitants of Tierra del Fuego, though this said little in their favour. Later, he turned, like every other person interested in matters Australian, to the exploration literature. As the material presented in Chapter 1 makes clear, his notebooks show that he was an avid reader of the works of Sturt, Mitchell and Grey and in his two books on human evolution The Descent of Man and The Expression of the Emotions in Man and Animals there are numerous references to the Australian natives. In neither of these works is there direct evidence that Darwin took over the ideological views of his correspondents when formulating his theoretical ideas. That they were implicit in his thinking, however, can be seen from other available evidence. The best example of this brings together the two founders of the theory of natural selection. While they differed on key points, this exchange makes it clear that they shared certain assumptions about the relationship between the races of man and accepted prevailing attitudes towards the effects of cultural collision.

28 Henry Reynolds, op. cit, note 1, 129.

In 1864 Alfred Russel Wallace wrote an important paper entitled 'The Development of Human Races Under the Law of Natural Selection' in which he claimed that:

It is the same great law of “the preservation of the favoured races in the struggle for life” which leads to the inevitable extinction of all those low and mentally undeveloped populations with which Europeans come into contact. The Red Indian in North America and in Brazil; the Tasmanian, Australian and New Zealander in the southern hemisphere, die out not from any one special cause, but from the inevitable effects of an unequal mental and physical struggle.  

'The preservation of the favoured races in the struggle for life' is of course the sub-title of the Origin of Species, and Wallace removed any doubt about the extent to which he was applying the principles of natural selection to the human realm when he added later that the native races die out and are replaced just as the weeds of Europe overrun North America and Australia, extinguishing native productions by the inherent vigour of their organisation, and by their greater capacity for existence and multiplication. 

Darwin's response to Wallace's paper illustrates the lengths to which he was personally prepared to go in allowing his theory to incorporate human history and development. Commenting on Wallace's discussion of natural selection, he sought to strengthen the point by alluding to his own reading of the Australian literature: 'when reading Sir George Grey's account of Australian savages, I remember thinking that natural selection would come in'.

It is surprising that this striking, and by Darwin's standards unambiguous, application of natural selection to human evolution has not excited more attention among Darwinian scholars engaged in the debate.


31 Ibid. 319.

over the extent to which Darwin was a social Darwinist.\textsuperscript{33} The text of this letter to Wallace, and the context in which it occurs, would seem to suggest that at this relatively late stage – four years after the first appearance of the Origin – Darwin was quite comfortable with the extension of his theory to include human social evolution. Indeed a plain reading of the text makes it abundantly clear that the distinction between the natural and social worlds was simply not an issue here. Such an interpretation supports a point made by Dov Ospovat in his seminal work, \textit{The Development of Darwin's Theory}, which bears quoting in full

\begin{quote}
in the second and subsequent editions of the Origin Darwin argued that the equation "more fit = higher" is generally correct. Those who later took Darwin's theory as a basis for ideologies of progress and the natural dominance of "higher" over "lower" human races were not required to distort it to serve their purposes. The theory itself already contained elements of such an analysis.\textsuperscript{34}
\end{quote}

Ospovat remained unsure of the extent to which Darwin shared the social attitudes his theory was validating, but the letter to Wallace (and what follows below) strongly supports James Moore's claim that Darwin would have seen no difficulty in applying his theory to human social evolution. In any event, Ospovat's claim that regardless of his personal attitude Darwin 'was building his theory out of ideologically loaded concepts' can hardly be denied in the light of the available evidence.\textsuperscript{35}

We know that Darwin changed his position on the question of 'higher' and 'lower' organisms before the second edition of the Origin

\textsuperscript{33} An important exception to this neglect can be found in an essay by John C. Greene, 'Darwin as a Social Evolutionist', first published in the Journal of the History of Biology, 10 (1977), 1 - 27 and reprinted in \textit{Science, Ideology, and World View} (Berkeley: University of California Press, 1981), 95-127. Greene does not mention the reference to Grey however. Wallace responded to Darwin by pointing out some rather obvious faults of reasoning 'With regard to the constant battles of savages leading to selection of physical superiority, I think it would be very imperfect, and subject to so many exceptions and irregularities that it could produce no definite result. For instance, the strongest and bravest men would lead and expose themselves most, and would therefore be most subject to wounds and death...Again, superior cunning, stealth and swiftness of foot, or even better weapons, would often lead to victory as well as mere physical strength.' Wallace to Darwin, May 29, 1864, in James Marchant, \textit{op. cit}, note 33, volume 1, 154.


\textsuperscript{35} Ibid. 233.
appeared. From initially determining not to talk in such terms he moved to accepting the view that, as Ospovat says, 'higher' equals 'more fit'. In the debate with Joseph Hooker discussed in Chapter 1, over the relationship of the floras of Eastern and Western Australia, Darwin argued that his new position was supported by the manner in which the plants of the northern hemisphere were overrunning those in the south. Wallace's weed analogy alluded to above therefore had impeccable credentials.

However one can go back even earlier to find Darwin arguing, within an Australian context, the same point and this time in relation to man and the relative fitness of different cultures. The example illustrates the re-emergence of the old ideology of conquest and the pastoral ethic in the guise of Darwinian scientific theory. In 1870 the Australian writer and historian James Bonwick published an important book detailing the destruction of Aboriginal culture in Tasmania. Of that destruction he wrote 'such will sadly demonstrate Mr Darwin's philosophy that "the varieties of man seem to act on each other in the same way as different species of animals; the stronger always extirpates the weaker"'. 36 Now compare this with the following quotation taken from the Swedish naturalist Carl Lumholtz's description of his travels in Queensland, published in 1888: 'when civilised nations come into contact with barbarians the struggle is but short, excepting where a dangerous climate helps the native race, says Mr Darwin, and history corroborates his statement.' 37

The essential similarity of these two references is indisputable, and the two authors making them did so in the full expectation that their readers would understand the force of giving a scientific explanation for disturbing socio-cultural phenomena. What is interesting however is the provenance of the two Darwinian references. Lumholtz was making use of the Descent of Man and, to the extent that it was a post-Origin reference unproblematic as a case of standard Social Darwinian rhetoric, one of many that historians have uncovered. 38 The Bonwick quotation, however, is much more intriguing, for it comes not from the Descent nor indeed from any of Darwin's explicitly anthropological works; it can be found in the


37 Carl Sophus Lumholtz, Among Cannibals: An Account of Four Years Travel in Australia etc, (London: John Murray, 1889), 376.

38 James Moore, op. cit, note 7, 63 - 64.
Journal of Researches, published in 1839, twenty years before the theory of natural selection was presented to the world. And an analysis of the source of the reference shows that the initial observations on which it was based were made by Darwin in New South Wales in 1836, during the Beagle voyage.

Wherever the European has trod, death seems to pursue the aboriginal. We may look to the wide extent of the Americas, Polynesia, the Cape of Good Hope, and Australia, and we shall find the same result ... The varieties of man seem to act on each other; in the same way as different species of animals - the stronger always extirpate the weaker.39

Two important points emerge from all this. Firstly, any plain reading of Darwin's words makes it clear that he held views that were later to be encapsulated in the term 'social Darwinism' before he had worked out the theory of natural selection. At the risk of labouring the point, there are grounds for believing that these views were to some extent formed in the light of his observations and experiences in Australia where he was exposed to the squatter theory of value and the pastoral ethic first hand. And Darwin, as we know, spent some time partaking of the hospitality of some of Australia's pastoral elite, including a section of the Macarthur clan, one of whom, James Macarthur, he later met and dined with in London in the 1850s.40 Later of course, his ideas on the comparative fitness of cultures was strengthened by his reading of the scientific and exploration literature emanating from Australia. This suggested to him ways in which the mechanism of natural selection might apply in the case of man - as his letter to Wallace makes clear.

The second point which emerges from this discussion is that Bonwick's use of a Darwinian reference which predates the development of Darwin's ideas on evolution, shows the extent to which Darwin's anthropological ideas were constructed out of commonly understood ideologically loaded elements. The polemical words of James Macarthur and the Sydney Morning Herald previously quoted were transformed into

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39 Charles Darwin, op. cit, note 29, 520.
the language of science and made the basis of belief in natural law which determined that 'when civilised nations come into contact with barbarians the struggle is but short'. As scientific truth, this could now be re-integrated into the governing ideology as justification for the destruction of native culture or, as in the cases of Bonwick and Lumholtz, as an explanation for it. The consequences that could be derived from this scientised version of an old ideology were all articulated in the philosophy of post-Origin social Darwinism. 'Pitiless nature' guaranteed that the destruction of the Aboriginal population was both inevitable and amoral for it was due to the forces of destiny. Efforts to intervene in the process were a 'malign influence', a hindrance to the further evolution of the higher European races. From the standpoint of human sensibilities, the 'passing of the Aborigines' was no more than a minor drawback to a larger good: the evolution of a higher race which would emerge from the white colonisers of the continent.41

RE-IMPORTING THE IDEOLOGY: HEARN TO SPENCER
Henry Reynolds describes the totality of evolutionary philosophy as it was applied to the Australian Aborigines as 'flourishing racism'. 'Social Darwinism carried a message of struggle, competition and violence, it swept away philanthropy, multi-racial-creation etc in favour of 'inevitable natural law'.42 The word 'social' can now be removed from this analysis and some recognition made of the fact that 'inevitable natural law' was not an idea which needed Darwin's imprimatur in relation to the decline of the Aborigines, although the general acceptance of Darwinism later in the century certainly gave new force to the concept. Once bolstered with the scientific authority of Darwinian theory, the colonial picture of the Aborigines became part of the attempt to construct an evolutionary anthropology. Armchair theorists in Europe and America called on their Australian correspondents for information and received a wealth of detail which in broad terms supported a picture of social evolution in which lower races were assumed to be remnants of earlier stages in the rise of humanity. The armchair theorists worked on material that was already


42 Henry Reynolds, op. cit, note 1, 129.
heavily value and theory laden, and added further scientific value to it before re-exporting it to its source. Australian contributors were important figures in the scientific landscape not mere servants at the periphery tyrannized by distance and isolated from intellectual contact with their European colleagues. Their work, as culturally constructed as any could be, was crucial to the development of the anthropological sciences which evolutionary theory influenced so much in the second half of the nineteenth-century. 43

Those responsible for providing an evolutionary interpretation of Australia's native population after 1860 came from a wide spectrum of colonial society. Many were academics engaged in University work, while others were missionaries, government officials or popular writers. The numbers involved were small but insofar as their influence extended beyond the colonial setting, significant. Defining the place of the Aborigines in nature and colonial society often meant redefining old material through the medium of social-evolutionary philosophy, if not always specifically Darwinian theory.

The legal status of the Aborigines within the jurisdiction of British law remained a matter of debate until 1967, when they were finally granted full citizen rights and included in the national census figures. The legal fiction of terra nullius under which James Cook took possession of the continent in 1769 made it difficult for the British authorities to include the native population within the law as anything more than property. To the ordinary European settler, they were part of the natural realm of the continent; their failure to use land in European style left them open to the charge that they should give way to those who would. As colonial governments after mid-century began to grapple with the question of dealing with the remaining native groups, legal opinion as to their status took on some importance. In Victoria W. E. Hearn sought to clarify the issue in his textbook The Theory of Legal Duties and Rights published in 1883. According to Hearn, the natives were outside of the sanction of the law except where their interests impinged in some way on the interests of third parties who were included within its ambit. They were 'the objects to which the prescribed forbearances apply, but they are not the third parties for whose benefit the forbearance is intended.' The duties of the law toward

43 For a discussion of the relationship of Australian scientists to their patrons in Europe see Ian Inkster, 'Scientific enterprise and the colonial 'model': observations on Australian experience in historical context', Social Studies of Science, 15, (1985), 677-704.
the Aborigines were to be understood as a branch of 'Absolute Duties', defined by Hearn as 'duties performed for the benefit of the population at large, not the parties to which the duties are addressed'. Hearn then elaborated on the implications:

These duties are commands given for the purposes of public policy to all persons, requiring them to observe certain forbearances in respect to these natives. That is, the Aborigines are the objects to which the prescribed forbearance is intended. They are thus in the same position as those lower animals in whose behalf the law in certain circumstances thinks fit to interpose. Duties are cast upon the owners of cattle ... It would be absurd to say that these animals, whether tame or wild, had rights. They are simply the secondary objects of absolute duties.

Hearn's equating of the social situation of the Aborigines with the ownership of cattle should not be taken as an example of a legal nicety only, because, as the analysis in the last chapter illustrated, his ideas on the evolution of society required that the savage races of the world be understood as vestiges of an earlier and more primitive period of human history.

Hearn gave it as a maxim that 'between the laws of nature and the laws of the Queen there is no resemblance and no means of comparison', but he was nonetheless prepared to resort to biological analogies to illustrate points relating to social matters. Furthermore, the discussion of social development in Plutology was carried on within a framework of biological terminology strongly influenced by the organic development theories of Herbert Spencer, who was given as the source of much of Hearn's material. Social change was implicitly assumed by Hearn to follow analogous patterns to change in the organic realm.

Alexander Sutherland, a writer on numerous scientific and social topics including the evolution of the moral instinct constructed a hierarchical racial tree which was still in use well into the twentieth century. The Aborigines were placed among the middle rank of savages where they inhabited a twilight zone between the lower animals and

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45 Ibid. 60.
46 Ibid. 8.
civilisation. Writing in the 1880s and 90s Sutherland had the benefit of Hearn's earlier writings to guide him, along with the contemporary literature emanating from Europe. He had no first hand knowledge of the Aborigines but had no qualms about pointing to the 'inadequately developed brain' and the 'misery' of their mode of living when describing their inevitable decline. Sutherland claimed that they placed little value on human life, and though affectionate to the children they allowed to survive, had no compunction in killing those who were unwanted at birth. Extending Hearn's invocation of biology to illustrate the chasm between Aboriginal culture and that of the higher races, Sutherland asserted that 'we must be content to look upon their customs, their moral notions, as so many biological facts without presuming to try them by laws which they do not own and have never dreamt of'. Given the deterministic nature of this analysis it is not surprising that Sutherland denied that there were any ethical issues involved in the demise of the Aborigines. Indeed their passing was a positive step in the further evolution of the higher races 'to the sentimentalist it is undoubtedly an iniquity; to the practical it represents a distinct step in human progress involving the sacrificing of a few thousand of an inferior race'.

Another social commentator who made a name locally and internationally was the Australian radical Charles Henry Pearson. In his influential book, National Life and Character, Pearson praised the extension of Anglo-Saxon culture around the globe, using the Australian case as an example of its virtues: 'Australia is an unexampled instance of a great continent that has been left for the first civilised people that found it to take and occupy. The natives have died out as we approached; there have been no complications with foreign powers; and the climate of the South is magnificent'.

Social theorists like Hearn, Sutherland and Pearson won a wide audience at home and abroad but a more lasting influence emerged with the


52 Ibid, 29.


earliest generation of Australian anthropologists. Social evolutionary theory provided the direct stimulus for much of this early work as the case of Alfred Howitt demonstrates. In 1880, Howitt and his collaborator Lorimer Fison produced one of the most important contributions to anthropology ever written in Australia. *Kamilaroi and Kurnai* dealt with group marriage, elopement and kinship among the two Aboriginal groups named in the title. The book was dedicated to Lewis Henry Morgan who agreed to write a prefatory note. This 'note' ran to 20 pages and in it Morgan described the Aborigines as 'melting away before the touch of civilisation even more rapidly than the American aborigines'. He continued:

In a lower ethnical condition than the latter, they have displayed less power of resistance. They now represent the condition of mankind in savagery better than it is elsewhere represented on the earth - a condition now rapidly passing away, through the destructive influence of superior races.\(^5^5\)

Morgan protested against the worst excesses of the Europeans against the natives but it is abundantly clear that he shared his Australian correspondents' belief that they represented a relic from an earlier age. Morgan did not stipulate in this note the extent to which he believed that biology determined the Aborigines condition, but Howitt provided a bleak picture of the likelihood that they could raise themselves to a higher stage:

According to my experience, the young Kurnai can learn with great facility. He has great imitative powers and therefore often acquires an excellent handwriting; but he also unlearns with great facility. In this we must recognise mental powers naturally good but not fixed by hereditary training. We must say, I think that his mind develops quickly, and perhaps fully up to the standard of that of a white child of twelve or fourteen, but there stops.\(^5^6\)

Trapped in a backwater of cultural evolution according to Morgan's scheme of human history, the Aborigine was equally caught in Howitt's analysis (which is distinctly deterministic), in a state of mental underdevelopment. Biology prevents the development of the Aboriginal mind beyond the level of the child. It was not the practices of the Europeans


\(^{56}\) Lorimer Fison & Alfred Howitt, op. cit, note 55, 260.
that were bringing about decline - the introduction of alcohol and disease for instance - but an inevitable law of which they were but the agents. The observations of Sturt and others that suggested socio-cultural reasons for the decline of the natives gave way to a belief in what Howitt described in a letter to Morgan as 'the principle of Evolution'.

Metaphysical principles blended into natural law, to such an extent that even those possessed of some sympathy for the Aborigines accepted it - recall the previous references from Bonwick and Lumholtz both of whom spoke out against the way in which the Europeans were actively seeking to destroy the native culture. The picture of the Aborigines as a low if pitiable race very soon found its way into the popular culture. Notable overseas visitors to Australia quickly assessed the hopelessness of the Aborigines cause. Anthony Trollope said in 1872 that trying to assist the Aborigines was 'not worth the candle ... The race is doomed, and is very quickly encountering its doom'. The Australian poet Henry Lawson put into verse his own memories of the racist indoctrination commonly found in the schoolroom:

And Ireland! - that was known from the coast line to Athlone,
But little of the land that gave us birth;
Save that Captain Cook was killed (and was very likely grilled)
And "our blacks are just the lowest race on earth"

And a woodcut in its place, of the same degraded race,
More like camels than the blackmen that we knew.

It was the work of Walter Baldwin Spencer which proved the most fruitful for the armchair theorists of Europe. Spencer studied under Edward Tylor and assisted in the transfer of the Pitt-Rivers ethnological museum to Oxford. In 1867, A. H. Pitt-Rivers had described the Aborigines as 'living representatives of our common ancestors' whose material culture stood in the same relation to that of modern Europe 'as the mollusca of recent species

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58 Quoted in Noel McLachlan, op. cit, note 1, 121.

to the mollusca of the primary geological period.60 Spencer imbied these images, and the results are to be found scattered throughout his many volumes on the Aborigines written between 1898 and 1926. However kindly disposed the white settler may be, his advent at once and of necessity introduces a disturbing element into the environment of the native, and from that moment degeneration sets in, no matter how friendly may be the relations between the Aborigines and the newcomers.61 Nearly three decades after he wrote this, when summarizing his years of anthropological investigation, Spencer described Australia as the home of creatures:

- crude and quaint, that have elsewhere passed away and given place to higher forms. This applies equally to the Aboriginal as to the platypus and kangaroo. Just as the platypus, laying its eggs and feebly suckling its young, reveals a mammal in the making, so does the Aboriginal show us, at least in broad outline, what an early man must have been like before he learned to read and write.62

Visitors to the National Museum of Victoria who might not have been expected to read Spencer & Gillen's voluminous publications were given the message nonetheless, for Spencer repeated the description in his guidebook to the Aboriginal material in the National Museum of Victoria, still in print in 1922.63

THE LATER BRITISH DARWINIANS AND THE ABORIGINES
The manner in which the scientific understanding of the Australian Aborigines developed throughout the nineteenth-century is reminiscent of the exchanges of trade and industry. This chapter has suggested how ideas have been exported and re-imported and then exported again from


Australia with value being added at each step of the way. From the early colonial picture of the Aborigines as an inferior race destined for extinction due to their failure to use the land and therefore develop towards civilisation, to the Darwinian image of the same race as a biological and cultural relic, a living fossil, the ideological component remained largely intact. But just as Australia's natural products are exported as raw materials, so its scientific materials are said to be exported raw and unfinished, with no value added. The case of the Australian Aborigines demonstrates how simplistic this view is. Pre-Darwinian attitudes towards the Aborigines depended on value judgements and cultural interpretations about what place in the scheme of things 'primitive races' held. The European theorists from Darwin and Wallace to Morgan and beyond utilised colonial resources as they received them, wrapped in a package of socio-cultural ideology, and then reprocessed those resources into a more refined but essentially similar product. Imported back into Australia, the post-Darwinian picture of the Aborigine became the framework within which anthropologists and sociologists on the spot carried out their work, adding more value to the developing product. Exporting it once again it became valuable source material for another generation of social commentators - Edward Tylor, John Lubbock and James Frazer being perhaps the best known.

Towards the end of the century the interest in evolutionary theory as an explanatory framework reached its height. Every facet of human life and endeavour was subsumed beneath the banner of evolutionary progress. Even science itself became incorporated into the process; just as the anthropologists and sociologists sought to unravel the development of society and its institutions, so the theorists of science sought to incorporate its development, too, into an evolutionary scheme. William Stanley Jevons for example, while denying that human thought and historical and cultural development could be understood through the application of scientific principles, still turned to a form of argument which depended on the assumption of an advancing human knowledge and industrial civilisation when making his case.

No one can safely generalise upon the subtle variations of temper and emotion which may arise in a person of ordinary character ... Character grows more many sided. Two well educated Englishmen are far better distinguished from each
other than two common labourers and these are better distinguished than two Australian Aborigines.64

The evolutionary connection in this passage may seem vague until it is remembered that the type of differentiation Jevons is describing was a central factor of Herbert Spencer’s notion that evolution was exemplified by the growth of heterogeneity, or for that matter, Darwin’s ideas on the growing diversity brought about in the natural world by natural selection. Implicit in Jevons words is the belief that the ‘well educated Englishmen’ were at a higher stage of development than labourers and Aborigines.

When Karl Pearson came to write his classic text The Grammar of Science in 1892, evolution provided the backdrop against which the merits of scientific claims were assessed. The complete Darwinian, Pearson lectured often on the application of evolutionary principles to past, present and future states of humanity. For example, in 1901 he wrote that ‘the path of progress is strewn with the wreck of nations; traces are everywhere to be seen of the hecatombs of inferior races ... Yet these dead people are in very truth the stepping stones on which mankind has risen’.65 Henry Reynolds used this quote to draw attention to Pearson’s social Darwinian attitude towards primitive races and in that respect the case is unproblematic. In The Grammar of Science, however, Pearson was setting down the principles and methods of science, a study of the ‘foundations’ and ‘fundamental concepts of modern science... free from metaphysics’.66 Since its publication it has become a recognised classic, setting out the principles of scientific methodology, the facts of science, natural law, cause and effect, time, motion, matter and the laws of life. In the first edition Pearson wrote in the chapter entitled “Life” that,

It cannot be indifferent to mankind as a whole whether the occupants of a country leaves its fields untilled, and its natural resources underdeveloped. It is a false view of human solidarity, a weak humanitarianism, not a true humanism, which regrets that a capable and stalwart race of white men should replace a dark-skinned tribe which can neither utilise


65 Henry Reynolds, op. cit, note 1, 125.

its land for the full benefit of mankind, nor contribute its quota to the common stock of human knowledge.67

Pearson’s claim to be dealing in what one may briefly describe as the objective factors of science appears on first sight to be at odds with this statement. On reflection however, it becomes evident that the Aborigines and their impending demise were both seen by Pearson as factual elements in an evolutionary understanding of life. Rather than indulging in subjective analysis of a humanitarian problem, Pearson was making the strong claim that the Aborigines were themselves so much scientific data. In a footnote to this paragraph, he stressed that his words were not to be taken as justification for deliberately destroying life, because ‘the anti-social effects of such a mode of accelerating the survival of the fittest may go far to destroy the preponderating fitness of the survivor’. Notwithstanding this rider, the historical trend was clear for ‘at the same time there is cause for human satisfaction in the replacement of the aborigines throughout America and Australia by races of a far higher civilisation’68

From being a mere impediment to European settlement, the Australian Aborigines had become an object of scientific enquiry, and a scientific object, a salutary reminder of the inevitability of the social and intellectual progress of humanity as a whole, and a sign that such progress could be understood by applying scientific principles. Their incorporation into the evolutionary world-view of post-Darwinian Western culture was to all intents and purposes the completion of a process of classification which had begun nearly a century before.

CONCLUSION.
Jim Moore has argued that the historiography of Darwinism and Social Darwinism has until recently been seen in terms of good and bad lines of historical descent with pure lines emerging from the work of Charles Darwin himself and impure ones traceable to Herbert Spencer and his followers. As argued by Young, Barnes, Shapin and Moore himself, this dichotomy is more the product of particular approaches to historiographical discourse than the reflection of some historical reality. Some of the strongest defenders of the purity of Darwin’s thought are now conceding his ‘progressionist’ tendencies in relation to human physical and

67 Ibid. 438.

68 Ibid. 438.
cultural evolution, so the revisionists case is clearly a strong one. As the argument of this chapter has sought to demonstrate, the roots of Darwin's ideas on human evolution are in part to be sought in his use, over some thirty years, of material sent to him from Australia. By incorporating this material, with all its ideological wrapping, into his anthropology Darwin was providing scientific credence to an ideological position that had for decades been the basis of European and Aboriginal relationships in Australia. In a very strong sense, the mould into which the Australian Aborigines were cast by the European settlers was essentially the same at the end of the nineteenth-century as it had been at the beginning. What changed was the manner of legitimation of that mould. Nineteenth-century anthropological science, strongly influenced by evolutionary doctrines, was a product of ideologically-loaded resources, and much of that ideology was of Australian colonial origin.

69 For an example of a scholar moving from the older to the newer position, see the chapter by Michael Ruse, 'Molecules to Men: Evolutionary Biology and Thoughts of Progress' in Mathew H. Nitecki, Editor, *Evolutionary Progress*, (Chicago: University of Chicago Press, 1988), 97-126.
CHAPTER 7

EVOLUTION AS WORLD-VIEW:
THE WORK OF ALEXANDER SUTHERLAND

In chapters 4 and 5 attention was drawn to the manner in which evolutionary theory was initially received after the publication of the Origin of Species. While there was no uniformity of opinion amongst supporters or critics in relation to the scientific status of Darwinism, there was a general recognition that a scientifically formulated evolutionary outlook signalled a radical change in attitude to the natural world and that this in turn would result in major changes in the understanding of human history and social development. A Darwinian world view had no need of teleological explanation and was indeed usually seen as undermining the argument for design; it caused a breach between the previously widely accepted idea that natural theology and revealed religion were twin components of a sound religious belief system. While, as Robert Young has said, Darwinism was for many made palatable by accommodating it to some older Paleyan natural theology, it was an accommodation which ultimately led to a revolutionary change in world view for many, if not most, educated citizens of western societies. It was possible for a Hearn or a Bromby for example to be enthusiastic about evolution and willing to use its explanatory power to shed light on crucial questions - the evolution of society, the development of scriptural theology - without abandoning traditional religious values and institutions. For others, evolution meant freedom from old orthodoxies and the prospect of fashioning a new metaphysics built upon the optimism and excitement of scientific discovery.

Frank Turner has drawn attention to the enthusiasm with which many late nineteenth-century intellectuals turned to science not only to provide an alternative to religious belief but also as a mechanism for social engineering. In his discussion of what he called Victorian scientific naturalism Turner points out that while proponents might not be of one mind on all aspects of the programme, there were enough common bonds and objectives to see them as forming a group. While

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there were many prominent earlier advocates of a naturalistic approach to science, this later group, centred around Huxley, John Tyndall, W.K. Clifford and their associates tended to be agnostics in religion and sought for a clear line of demarcation between religion and science. The programme found a wide audience in Britain, Germany, and the United States in particular, and quickly became part of the credo of imperialists, social Darwinists and capitalists.

At least one Australian seems to fit the bill as a member of the scientific naturalists. Alexander Sutherland, mentioned in the previous Chapter in relation to the Australian Aborigines, produced a body of writings on a wide range of topics which resonate with the enthusiasm of one who has apparently accepted totally the scientific worldview as depicted by Turner. Across subjects as distinct as Australian literature, 'the woman question', modern warfare, the body temperature of animals, and the origin of the moral instinct in man, Sutherland maintained belief in the guiding thread of law-abiding force and matter. And running as a leitmotif through all his writings is the idea of evolution; Darwinian evolution in the main, when the topic is a specific one (as in the case of his work on the moral instinct), but overall a more general evolution akin to that propounded by Herbert Spencer. For Sutherland, evolution was the universal constant, the guarantor of progress, the shackle on revolutionary social upheaval and the justification of colonial and imperial activity. In many ways Sutherland fits the stereotype of the 'total evolutionist', defined by Maurice Mandelbaum as one who believed that 'each aspect of the whole obeys the same all pervasive law, and each may be said to be part of a single, immensely dense series, progressively unfolding'. With all this said, it remains true that in some key respects Sutherland departed from the stereotypical 'scientific naturalist'. Rather like Herbert Spencer, Sutherland seems to have believed that spirit, lay at the heart of the universe. Unlike his close friend Henry Gyles Turner he rarely

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seems to have actively involved himself in anti-religious activity, and
indeed praised religion to the extent that it had furthered the evolution of
sympathetic feeling.

Sutherland arrived in Australia in 1864 aged twelve. In 1870 he entered the University of Melbourne, reaching honours standard at three levels and sharing the Shakespeare Prize for literature with Henry Bournes Higgins, who was to play an important role in later life as the first judge of the Arbitration Court of Australia. With Higgins, the future Liberal Prime Minister, Alfred Deakin, and the psychical researcher Richard Hodgson, Sutherland formed a debating society at the University under the eye of Charles Henry Pearson. The 'brilliant quartette' as Deakin's sister called them, were all strongly influenced by Pearson and Hearn. In different ways each shared an enthusiasm for science and the social and philosophical promise it appeared to hold out, but only Sutherland undertook any extensive scientific enquiry.

Along with the intellectual atmosphere to be found in university life, Sutherland had the added advantage of being a member of an extremely cerebral family. His brother William, despite working with all the disadvantages accruing from geographical isolation and chronic ill-health, did important work in theoretical physics, corresponding with three Nobel Laureates, W. H. Bragg, J. J. Thompson and Ernest Rutherford. A second brother, George, wrote a number of books on Australian geography and history, while a third, John produced school text books and wrote a volume with the intriguing title of The Bonds of Society. A sister, Jane, has a significant and

4 An exception to this occurred when Sutherland entered the row over the the supposed heresy of Charles Strong, leader of the Melbourne Presbyterians.(see the next chapter for a discussion of this controversy). Sutherland apparently attacked the Westminster Confession of Faith during a dispute with the Moderator of the Church. See Henry Gyles Turner, Alexander Sutherland, M.A., (Melbourne: T. C. Lothian, 1908), 33-34.


7 For George Sutherland see Suzanne G. Mellor, 'George Sutherland', Australian Dictionary of Biography, volume 6, (Melbourne: Melbourne University Press, 1976),
growing reputation in the history of Australian art, with paintings hanging in the National Galleries of Victoria and Canberra, while George's daughter Margaret is arguably the finest composer produced in Australia to date.8

After completing his degree, Alexander spent a short period as mathematics master at Scotch College before purchasing the Carlton College in Melbourne in 1877. In 1892 he sold the college in order to devote his time to scientific and literary study. From the late 1870s on he delivered some two hundred lectures on scientific and literary subjects and contributed articles to local journals while at the same time writing regularly for the Argus. His early retirement was cut short when he lost heavily in the financial crash of the nineties and was forced to turn to journalism. In 1898 he went to London as correspondent for the South Australian Register, but returned due to ill health eighteen months later and in 1901 became registrar of the University of Melbourne. A fatal heart attack in the following year almost certainly deprived him of a chair in literature in that institution.

LECTURES AND WRITINGS.

To get the best understanding of Sutherland's almost obsessive attitude towards a naturalistic interpretation of the material world and the all pervasiveness of evolution in his thinking, one needs to examine the whole range of his lectures and writings. In 1882 he read a paper before the Royal Society of Victoria, later published in The Southern Science Record, seeking to show that the barrier between animate and inanimate matter, could be dissolved by applying the law of the conservation of energy.9 All matter derives its energy from internal sources, and the energy in so called inanimate matter is in no way different from that exhibited by animate matter at least at the lowest

8 For Jane Sutherland, see Frances Lindsay, 'Jane Sutherland', Australian Dictionary of Biography, volume 12, (Melbourne: Melbourne University Press, 1990), 140-41.

9 Alexander Sutherland, 'The Vanishing Boundary between the Animate and the Inanimate', The Southern Science Record, volume 2, January-December, 1882, 119-23.
levels of life. To appeal to sources of energy other than those of the Sun and those already present in the organism to explain animate behaviour would be resorting to occult forces and abandoning scientific principles—that is, scientific principles as they were understood by scientific naturalists. Sutherland was therefore arguing for an explanation in terms of known physical forces which would unite the animate and inanimate realms in an overarching causal mechanism. And, importantly, for Sutherland it had to be a mechanism which eschewed discontinuity and brought known phenomena within the bounds of naturalistic explanation. 'Nature has made no rigid lines of demarcation', everything is continuous in time and space; the essential unity of plant and animal life and the collapsing barrier between organic and inorganic chemistry supported this notion. But Sutherland was prepared to go further. At the atomic level all is motion with atoms having a 'directive power' akin to instinct in living beings, along with the ability to unite unstable atoms so as to form stable substances. Similarly, one could compare the formation of salt crystals with 'the many wanderings of a crowd of bacteria in a drop of putrid water' and it took no great leap of the imagination to envisage how the external agency of the sun could energise inanimate atoms into becoming simple bacteria which then hand down the 'initial life impulse' from one generation to the next. As he had put it 5 years earlier, when discussing the possibility that there was a causal connection between the attraction of gravitation and the molecular energy of matter:

'It ... would be a step in the establishment of that conformity of nature, to which all science tends, if it could be shown for gravitation as it has recently been shown for electricity and magnetism that it is the effect of molecular vibration, propagated through the same omnipresent medium which conveys the vibrations of light, heat and actinism.'

10 Ibid. 119.

11 Ibid. 121-23.

12 Alexander Sutherland, 'On the Probability that a Connexion of Causality will be shown to exist between the Attraction of Gravitation and the Molecular Energy of Matter', Transactions & Proceedings of the Royal Society of Victoria, xiv, 1878, 90.
Somewhere in this combination of forces was to be found the explanation for all physical phenomena according to Sutherland.

Such confident claims were hardly likely to go unchallenged. One perceptive critic pointed out that the law of development (evolution) implied that animal instinct could not be equated with the fixed energy of inanimate matter because it was 'gradually acquired ... and always liable to change under varying circumstances and develop into an instinct of a totally different nature'. The analogy with salt crystals too was unsound, because no matter how often evaporated, the crystals kept the same fixed type. Even the humblest organisms however are subject to variation and selection so that they can change over time.\(^1\) Calling his critic a scientific conservative, Sutherland responded by denying that he had said there was no distinction between animate and inanimate matter, only that the gap between them was closing.\(^2\) The description was hardly fair; after all, fire was being fought with fire here, with one interpretation of evolutionary theory being pitted against conclusions drawn from another. Unabashed by Sutherland's criticism the anonymous critic responded by claiming that the belief in the continuity of nature was seriously flawed; the doctrine of the dissipation of energy 'which shows us that the total manifestation of energy in the Universe is a finite process' implies a beginning and an end to 'the present order of the Universe' which by definition must mean an interruption to the continuity of nature.\(^3\) Sutherland remained unmoved, and spent the best part of the next two decades investigating the continuities of nature he believed to be consonant with the theory of slow continuous change.

In two papers delivered to the Royal Society of Victoria in 1894 and 1897 Sutherland presented evidence to show that among all living things there was a law of gestation and incubation which could be quantified, and that the monotreme group represented the connecting

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1 A Member of the Field Naturalist Club of Victoria, 'The Distinction between the Living and the Not-Living', *The Southern Science Record*, volume 2, Number 7, July, 1882, 143-48.

2 Alexander Sutherland, 'The Living and the Not-Living', *The Southern Science Record*, volume 2, Number 8, August, 1882, 194-98.

3 A Member of the Field Naturalists Club of Victoria, 'The Living and the Not-Living', *The Southern Science Record*, volume 2, Number 9, 219-221.
link between the reptile and marsupial groups. Experiments undertaken with respect to the subject matter of the first had convinced him that among the birds the time required for hatching was inversely proportional to the square of the excess of the temperature above a certain fixed temperature. The time taken for different species to hatch varied according to particular temperatures, and Sutherland allied this to a suggestion from St George Mivart that the incubation period is related to bird size. Through a series of complex equations Sutherland went on to claim that the gestation period could be understood as being related to the growing increase of 'nerve complexity as gauged by size and efficiency of brain': the more complex the greater the period required. Once again it was continuity that was all important, although here it was continuity of a process that emerged as the key issue, whereas in the case mentioned earlier - the disappearing boundary between the animate and inanimate - it was continuity of nature. Sutherland was to make use of this material again when compiling evidence for an evolutionary theory of moral development in man.

Sutherland's paper on the body temperature of reptiles, monotremes and marsupials was also based on experiments conducted over a lengthy period. While recognising 'a real ... and in some respects radical distinction between warm and cold blooded animals' he claimed that 'there lies between these two types a line of steady gradation'. Reptiles are dependent on external factors for temperature control and generally have the lowest average body temperatures; monotremes have some internal control mechanisms but still show a tendency to vary with changing conditions. The marsupials have temperatures higher than monotremes but lower than mammals. Within each of these groups there are hierarchies of species and genus so that for example the


17 Alexander Sutherland, 'Laws of Incubation', op cit, note 16, 270.

18 Ibid. 280.

19 Alexander Sutherland, The Temperatures of Reptiles, Monotremes and Marsupials', op. cit, note 16, 57.
kangaroo, the highest ranking marsupial on the temperature scale came closest to the lowest ranking mammal group, the rodents. Once again it was all gradation, and such distinctions that existed were the result of continuous processes not violent revolutionary upheavals. The warm blooded state of the mammals was produced by no sudden emergence; the monotremes and marsupials form a gentle gradation between the reptile and the carnivore and ungulate; while so far as indications point, there is reason to believe that the lower birds are reminiscent of a once existent chain of links which equally joined the cold blooded lizards to these warmest blooded of all creatures, the passeriformes and fringilliformes. 20

Thus it was that continuity and gradation could be tied more closely with evolutionary doctrines; Darwinian theory was providing Sutherland with a series of questions the answers to which were to form the foundation for his own evolutionary theory of human morals. It was the Darwinian doctrine of small, continuous change that formed the backdrop against which the collectivity of Sutherland’s work should be assessed. And equally Darwinian was the emphasis he gave to the role of selection in bringing about that change. In November of 1897, Nature, well known for its support for the cause of scientific naturalism and evolutionary theory published an abridged version of the paper on body temperatures. 21

EDUCATION, WAR, AND WOMEN.

The micro studies on gestation and body temperature were supplemented by the more ideologically daunting topics of education, woman’s brain and the natural decline of warfare. All three subjects were dealt with in papers published in the English journal The Nineteenth Century in 1899 and 1900. While they post-date the work on the moral instinct to be detailed later it makes sense to deal with them here, primarily because they constitute something of a small corpus of related issues all of which display the same reliance on gradual change and progressive development. They are also less technical and more popular works. In the first Sutherland addressed the then fashionable

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20 Ibid. 67.
21 Nature, volume 57, Number 1464, November 18, 1897, 67-69.
issue of the fear of over-education of the lower social classes. Rejecting the popular view that giving the masses access to education would lead to a shortage of unskilled labour and create a demand for more fulfilling occupations that could not be met, he turned to the discoveries of science to show that there was a declining demand for such labour. The march of science is 'steadily sweeping away all those humblest classes of employment' and creating the need for new skills; telegraphy, photography and so on, trades born of scientific and technological discovery and invention. These were trades demanding a high degree of intellectual sophistication. The general tendency of social change then was to greater complexity and to a greater humanisation of the labour process. But - and it was a big but - it was a 'gradual creeping up' which is less effected by the promotion of individuals than promotion by generations, for example, the plumber educates his son to be an engineer'. Society then moves upward through the gradual replacement of brute labour dependent on physical strength to labour calling for more intellectual qualities. Promoting this Spencerian programme meant widening the school system to make it 'wiser in spirit'. That achieved, there would be nothing to fear from educating the masses, and everything to be hoped for.22

Sutherland's belief in the progress of mankind and the evolution of a more humane world was based on an evolutionary understanding of the rise of 'sympathy' as the foundation of a sound theory of morals; and human sympathy was central to Sutherland's discussion of a number of social issues. Needless to say there was always the requirement that one should take the long view, for sympathy was to be understood as the product of a biological evolutionary process that began almost at the dawn of life. Since the rise of the mammals especially there was an evident acceleration in the spread of the sympathetic response, but the final stages of the process remained far into the future.

Writing on 'The Natural Decline of Warfare', Sutherland argued that history clearly showed that as human sympathy developed so there was a decline in the 'military spirit'. As the current of human sympathy moved forward, 'neither marred nor made by human effort',

so warfare became less common and 'comparatively brief' in duration. Human desire to accelerate the process was futile, for the evolutionary scheme itself acted as a weeding out process, using warfare to eliminate the brutal and unsympathetic strains of humanity by 'slow degrees'. In its own good time the process would lead to peace becoming the norm. The word 'natural' in Sutherland's title tells all. It was not through diplomacy, peace treaties or national co-operation that permanent peace was to be achieved; such interferences in the natural process of evolution were likely to hinder rather than assist.23

The same picture emerges from Sutherland's foray into that great field of Victorian angst and controversy 'the woman question'. As the push for greater equality for women gathered strength in the latter decades of the century, opponents and supporters alike turned to science for evidence in favour of their positions. Charlotte Perkins Gilman, Annie Besant and Olive Schreiner used evolutionary theory to argue that the subjugation of women was the result of an unnatural set of social circumstances and not a biological imperative. Opponents of feminism used arguments from physiology to support the view that women were the less advanced sex; in particular, that they had smaller or less well developed brains. It was this last point that Sutherland took up in his paper 'Woman's Brain'.

After outlining the claims of a number of prominent physiologists in the matter of brain size and complexity, Sutherland concluded that most studies had serious methodological flaws, or in some cases were just plain fantastic, as in the case of the investigator who suggested that a comparison should be made between the weight of the brain and that of the thigh bone in men and women. Sutherland pointed out that evidence was accumulating that 'in the great mass of cases a practical equality in the male and female mind exists', so that, given the fact that the brain was the organ of mind, simple brain size or apparent differences in complexity were inadequate measures of sex differences. In fact, because brain size was to some extent at least dependent on body size, women seemed to have a slight advantage. However, this claim could be countered, according to Sutherland, if one took into account the fact that 'in proportion to its body weight, the

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23 Alexander Sutherland, 'The Natural Decline of Warfare', The Nineteenth Century, April 1899, 570-78.
smaller animal has always the larger brain', that is, cats have larger brains than tigers, mice than rats and so on. This was a rather cavalier move, involving shifting ground from a comparison of sex differences within species to differences between species, but it allowed Sutherland to maintain sexual distinctions without losing sight of his overall desire to counter crude anti-sexist attitudes. In fact, Sutherland used social attitudes toward women as one measure of a society's place in the social evolutionary scale, asserting that 'one of the surest tests in diagnosing the stage of a people's civilisation is the estimation in which the female intellect is held'. On that basis alone there was no reason to doubt that women doctors, clerics and politicians would eventually become commonplace.24

THE MORAL INSTINCT: SUTHERLAND'S EARLY INVESTIGATIONS.
The evolution of the mental faculties in man had become a major area for scientific investigation in the first decades after the publication of the Origin of Species. Darwin himself had devoted several chapters to the subject in The Descent of Man, arguing there that the foundations of man's intellectual and moral faculties were to be sought in the evolution of the social instincts in the lower animals.25 Among the chief factors in the rise of the moral sense according to Darwin was the strengthening of the bonds of sympathy through what would now be termed reciprocal altruism; members of any given society would assist other members facing danger on the sound basis that those so assisted would render similar assistance if the roles were ever reversed. Such actions would have evolutionary advantage for the community and would therefore be subject to natural selection. Over time, through inherited habitual practice, the growth of language and the intellectual faculties, a moral faculty incorporating all of these factors and stirred by conscience would arise.26 Darwin himself did not pursue in detail the evolutionary history

24 Alexander Sutherland, 'Woman's Brain', The Nineteenth Century, May, 1900, 802-10.
25 Charles Darwin, The Descent of Man, and Selection in Relation to Sex, 2 volumes, (London: John Murray, 1871), volume 1, Chapter 3, 'Comparison of the Mental Powers of Man and the Lower Animals'.
26 Ibid. 72ff.
of 'each separate faculty from the state in which it exists in the lower animals to that in which it exists in man', claiming that he had neither the ability nor knowledge to do so. Nonetheless, his writings on the subject set others to work; his neighbour John Lubbock produced a series of studies into instinctive behaviour amongst the invertebrates, while George John Romanes published three volumes dealing with the evolution of the mental and intellectual faculties in animals and man. By the time that Sutherland turned his attention to the problem of the moral instinct in man a weighty body of investigative work existed which drew on, and in turn influenced, disciplines as disparate as psychology, anthropology and sociology.

At the Australasian Association for the Advancement of Science Congress in Melbourne in 1890, Sutherland presented an early report of his investigations into the evolution of the moral instinct that was to culminate in a massively detailed, two-volume study eight years later. Entitled 'The Physiological Basis of Morals' the paper traced the origin of moral feeling to 'two interdependent yet distinct' portions of the nervous system, one being the cerebro-spinal and the other the sympathetic. The emotional and moral natures were largely a development of the latter. His overriding concern with continuities in nature led him to deny the existence of any kind of distinctive break between the animal and the human; the rudiments of moral feeling must, if the Darwinian evolutionary doctrine of slow gradual change be true, already be present in the lower animals. This was a line Darwin himself had taken in the Descent of Man and when dealing with the psychology of expression, so Sutherland was following in some illustrious footsteps. After making the point that 'the gap between the lower quadramana and the lowest savage nations, though considerable,

27 Ibid. 160.


29 'The Physiological Basis of Morals', reported in The Argus, 14 January, 1890. I have not sighted a complete transcript of this paper.
was by no means an impassable chasm', Sutherland turned to the example of the Australian Aborigines for an example of the workings of a primitive moral code. The Aboriginal was 'impelled to ... go out and get food for his starving child because it was impossible for him to sleep while the child was moaning, he must either dash its brains out or get it something to eat'. Thus 'seemingly moral acts' are little more than the result of ministering to one's own bodily needs, true altruism playing no part in the matter. The negative emotions experienced when not acting morally created imbalances in physiology, while positive emotions brought on by acting morally 'have a pleasantly stimulating effect on the sympathetic system'. Sutherland illustrated this with an analogy; the sight of a dog run over in the street 'provoked in some onlookers a feeling of sickness which was direct evidence of the influence of sympathy on the solar plexus, the source of stomach sickness'. The solar plexus was an important centre of 'sympathetic nerves' and Sutherland was confident that all sympathetic feelings had a 'similar physiological foundation'. Sympathy being the practical basis of all morality, it followed that, at base, morality was a physiologically caused phenomenon and not the result of a divinely implanted instinct called conscience. Sympathy between the sexes and between parents and children was biologically necessary in all the higher forms of life, for the preservation of the offspring. It could be shown empirically that fertility - judged by the numbers of offspring produced - diminished as one travelled up the evolutionary ladder of life, and protecting the fewer offspring produced at the top end of the ladder, therefore, required more parental care, which led inexorably to an increase in the moral quality of natural affections. Natural selection would favour individuals displaying the highest moral affections. Recapitulating his argument, Sutherland claimed (i) that morality was based on sympathy, (ii) that sympathy was essential if the animal kingdom was to reach its greatest potential, and (iii) that sympathy was dependent on a 'highly organised portion of the nervous system' and that both sympathy and its outgrowth, morality, were therefore dependent on physiology.

Newspaper reports of Sutherland's paper led to considerable public discussion in both Melbourne and Sydney. William Turner, a Presbyterian layman, sought to respond to Sutherland's

30 Ibid.
argument in a talk given before an audience at the Elsternwick Church in Melbourne. Turner agreed that human morality was not to be understood as a divine intervention into the natural process of life. He followed T.H. Green in preferring a Hegelian explanation, based on the notion that consciousness was the dominant feature of the universe, not matter. Rather than human morality being the product of a material basis, the reverse was true, for mind and its faculties (of which morality was one) was antecedent to matter. According to Turner, Darwin and by extension Sutherland, had gone beyond the evidence when attempting to trace the mental faculties of man to a material base. Sutherland rejected the charge of materialism, but Turner felt that this only confused his position. This was especially true where Sutherland had tried to trace the idea of sympathy to the sympathetic nervous system. As Turner put it, 'Mr. Sutherland by the language he employs, attributes to a certain system of nerves that which no nerves can exhibit, viz. 'sympathy'; there was no way in which nerves could 'secrete emotions'. Turner was also critical of Sutherland's claim that conscience was an organic growth that had arisen and developed because it had conferred selective value. Because conscience rarely if ever induced anything but 'painful' sensations it was difficult to see why it should be useful to the individual.

Several letters appeared in the Sydney Morning Herald after reports of Sutherland's address were published, and the paper printed an editorial critical of what it believed to be the materialist tenor that lay behind the attempt to found a science of morals on the findings of physiology. Conscience, the basis of morals according to the editorialist, 'has its origin somewhere outside man's physical nature'. This was not the worst, for more than religious beliefs were at stake 'if conscience is no more than a will-o'-the wisp, or the vibration of the nerves at the best, the fabric of society rests on less than nothing'.

31 Turner circulated the text of his talk as a privately printed pamphlet entitled *An Examination of Mr Alexander Sutherland's views on "The Physiological Basis of Morals"*. (Melbourne: Mason, Firth, McCutcheon, 1890)
32 William Turner, op. cit, note 31, 10-11.
33 Ibid. 16.
34 Sydney Morning Herald, 18 January, 1890.
Once again it was the spectre of fearful social consequences that was raised when discussing the implications of an evolutionary explanation for phenomena traditionally understood as belonging in the realm of religion. Sutherland, acting the part of a good scientific naturalist, was pushing as far as possible with an evolutionary programme, seeking the natural laws and continuities that underlay human behaviour. For those unprepared to go so far, that search could not go unchallenged, for in the words of the Sydney Morning Herald editorial writer, 'the question is one that concerns our very social existence'.

Attempting to placate his critics, Sutherland wrote to the Sydney paper pointing out that he was merely following normal scientific procedures in seeking a naturalistic explanation of what was admittedly a particularly sensitive problem. 'Soul, spirit, or mind is the ultimate fact of the universe; matter, so far as we have any power to know it, is but the impingement of certain forces upon this strangely mysterious consciousness'. Science was committed to dealing with matter which it had the duty 'of simplifying ... into terms of its lowest unknown'. This explanation was unlikely to change the opinion of Sutherland's more aggressive critics; it smacks of Herbert Spencer's 'Unknowable' as the ultimate cosmic force, but placed that force too far off for comfort for the more traditionally minded. It lacked precision even in comparison with Mathew Arnold's disarmingly vague conception of God as 'a power not ourselves that makes for righteousness', for the fact was that righteousness, was precisely what Sutherland was seeking to explain by appealing to a combination of physiological investigation and evolutionary theory.

THE COMPLETED VERSION
In 1898 Sutherland published the accumulated results of his investigations into the biological basis of human morality in The Origin and Growth of the Moral Instinct. He acknowledged two major sources as his inspiration, Darwin's Descent of Man and Adam Smith's Theory of Moral Sentiments. Sutherland claimed that his own work was in large measure a detailed expansion of the outline for an evolutionary approach to human moral instincts which Darwin had sketched in the first volume of his book. Like Robert Fitzgerald, he saw himself as

35 Sydney Morning Herald, 3 February, 1890
bolstering the evolutionary hypothesis with the sort of minutely worked out details that Darwin had been unable to provide. Smith’s influence was less obvious in the book; it stemmed from the fact that despite lacking the knowledge requisite to provide a fully biological account of human behaviour, Smith saw clearly that the moral instinct was founded on sympathy.

Put briefly, Sutherland’s thesis was that sympathy, the foundation of morality, originated among the lower animals in parental care which had itself arisen as a significant survival mechanism of the more ‘intelligent types’. From its original appearance, the sympathetic response ‘deepened and expanded’ until finally ‘the moral instinct with all its accompanying accessories, the sense of duty, the feeling of self respect, the enthusiasm of both the tender and the manly ideal of ethical beauty’ appeared. Finally, it remained for Sutherland to suggest a suitable physiological basis for the rise and development of the sympathetic responses. All of this could be done ‘with absolute certainty that development will be traced through lowliest savage to the noblest of man, always as a biological process’. While in essence Sutherland was, as he claimed, expanding Darwin’s own work, his emphasis on the parental instincts as the forerunner of the sympathetic responses effectively was slightly different to that of Darwin. While Darwin placed some importance on parental instincts, in the main he sought for the origin of morality in social instincts; Sutherland saw social instincts as a development of parental instincts.

Sutherland began his analysis by outlining the history of life through the appearance and characteristics of each major group, emphasising that the earliest and lowest orders of life tended to have the

36 Alexander Sutherland, *The Origin and Growth of the Moral Instinct*, 2 volumes, (London: Longmans, Green, and Co., 1898), vii

37 Ibid. viii

38 Ibid, Chapter 1, A Preliminary Outline

39 Charles Darwin, *The Descent of Man*, op. cit, note 26, The feeling of pleasure from society is probably an extension of the parental or filial affections, since the social instinct seems to be developed by the young remaining a long time with their parents; and this extension may be attributed to habit, but chiefly to natural selection. Greta Jones discusses Darwin’s attitude to the origin of morality with specific reference to Sutherland’s book, in Greta Jones, *Social Darwinism and English Thought*, (Sussex: Harvester Press, 1980), 46-47.
greatest fertility and therefore were subject to a high destruction of life through the intensity of natural selection. Species survival was dependent on a few individuals who by luck or some marginal advantage lived long enough to reproduce. As one ascended the ladder of life, fertility gradually decreased so that from some species of fish which might lay hundreds of thousands of eggs, eventually one got to the higher mammals including apes and man where the norm was just one or two offspring every two years. What might look like a precariously low rate of reproduction given the intensity of the struggle for survival, was counteracted by 'the development of qualities which procure for the individual more or less of immunity'. Chief of these qualities was the ever increasing depth of the parental instinct which makes possible the arrival in the evolutionary process the 'higher nervous types'. Tracing a line upward through the amphibians and reptiles, in which there was little or no parental instinct, through the birds, where the incubating instinct brings about some rudimentary parental feeling, Sutherland came to the mammals where increasing 'nerve development' led to greater parental care, though of an automatic and unconscious kind. Finally, with man, the parental instincts 'branch in all directions, and out of them grow ... all the varied virtues which form the great pre-eminence of man'. Thus the struggle for existence and the ever present action of natural selection brought about higher nerve development, lesser fecundity and greater parental care for offspring that took longer and longer to reach maturity and reproductive capacity.

Sutherland supported this picture of an unfolding drama in which the evolutionary process moved inexorably upward to the higher qualities of humanity, with a wealth of statistics and experimental proofs drawn from his own and others' work. The results of his experiments on gestation periods played a crucial role in his argument,

40 Alexander Sutherland, op. cit, note 36, 41.
41 Ibid. 24.
42 Ibid. 40.
43 Ibid. 54.
44 Ibid. 99.
as did his work on graduated temperature differences in the different groups of mammals. When it came to man, Sutherland constructed a four tier classificatory scheme in which the different groups within the human species could be placed. This was based not on racial distinctions but on the degree of intelligence each group exhibited, intelligence being defined in large measure by the stage of social development reached. The four tiers of humanity were Savages, Barbarians, Civilised and Cultured. Each tier was subdivided into ranks of Lower, Middle and Higher.

Among the Savages, represented by current day Bushmen in the Lower group, Australian Aboriginals in the Middle and American Indians in the Higher, the distinguishing feature was the 'constant struggle for sustenance' and reliance on an unpredictable nature. Among Barbarians, with Maoris in the lower group, Fijians in the Middle and Malayans in the Higher, the distinguishing features were forethought in directing the productive forces of nature through agriculture and the breeding of animals. In the third tier, represented by Arabs at the Lower level, Persians and Finns in the Middle and Chinese and Japanese in the Higher, it was the greater complexity of social forces, specialisation, bureaucracy and easily attained material comforts that were defining characteristics. The last and highest group, the Cultured, were represented only at the Lower level, for the Middle and Higher groups were projected by Sutherland as future developments. European nations and 'offshoots such as the peoples of the United States' were members of the Lower Cultured group, characterised by a high degree of social co-operation, easily secured material wants through the use of increased mechanisation and the growth of aesthetic and democratic forces in society.

While each of these four tiers had living representatives there were also historical groups which could be assigned to each from the Middle Barbarian up - Greeks of the Homeric age in the Middle Barbarian, Romans of the early Republic in the Higher Barbarian, Jews of the time of Solomon in the Lower Civilised, Romans of the later Republic in the Middle Civilised, and Italians, French, English and Germans of the fifteenth - century in the Higher Civilised. The inclusion of past and present societies in the scheme allowed Sutherland to add a certain dynamic aspect to it and no doubt lent his optimistic prediction of
the inevitability of yet higher stages of human progress some historically based support.\textsuperscript{45}

At the level of the Lower and Middle Savages, parental care is minimal; abortion and infanticide take the place of 'restraint', which can only become a factor in human society when a sufficiently strong parental instinct arises. As his discussion moved up through the tiers of humanity, Sutherland pointed out that more of the parental energies are put into raising fewer offspring, and there begins to emerge from the 'general sympathy' that exists at all levels a growing abhorrence of cruel practices, and with the arrival of human marriage the process of parental caring accelerates. In turn, parental sympathy leads to the growth of 'conjugal sympathy' and the idea of long term monogamous companionship. With the rise of humanity to the level of Lower Civilisation, commerce and industry became established and with it the notion of exchange value; husbands become aware of the value of bride purchase and the concept of 'virgin purity' emerges. Chastity therefore has social value for women but not, initially at least, for men, hence concubinage and polygamy proliferate. With the higher grades of civilisation emerges the recognition of the superior comfort of a peaceful home and a truly 'sympathetic union'; from this emerges concern for the feelings of the mate and a subsequent decline in male promiscuity. Alongside this arises parental love, with children raised in stable happy homes. The combination of parental and conjugal sympathy begins to be extended to other groups of mankind, who forming large armies and complex industrial organisations sweep away the less social 'savage races'. The arrival of the Lower Cultured level, sees sympathy extended beyond social or national boundaries to external groups, so that to the individual morality that has been slowly emerging from the general sympathy is added a type of international morality affecting behaviour between nations. One significant consequence of this is the decline of warfare (or at least a more humane pursuit of it) and a growth of a more international outlook. The future levels of society are matters of speculation only, but their eventual development is an inevitable consequence of the continuing process of natural selection acting so as to weed out the less sympathetic types.\textsuperscript{46}

\textsuperscript{45} Ibid. 103-108

\textsuperscript{46} Ibid. Chapter 6.
To what extent Sutherland was proposing anything particularly new with this account of the rise of human civilisation is difficult to assess. The notion of social and cultural progress was hardly original in 1898; Comte's stages of historical progress predate Darwin by two decades and other French thinkers had proposed a progressive history for mankind earlier still. British anthropological thought just prior to Darwin may, as George Stocking has recently made clear, have been dominated by Biblical ideas of civilisation being some sort of divine gift, with 'savages' remaining as a degenerate group. However, Edward Tylor's researches into the early history of human institutions was published in 1865 and those into primitive culture in 1871, Henry Maine's work on ancient law in 1861 and of course Darwin's work on the descent of man in 1871. While each dealt with different aspects of the evolution of man and society they shared a common belief in an upward movement of man from savage to civilised. Lewis Henry Morgan's influential work on ancient society, tracing 'the Lines of Human Progress from Savagery through Barbarism to civilisation' was published in 1877, perhaps the most prominent of all the post-Darwinian attempts to periodise human history. Sutherland therefore had an extensive literature to call on, and, more importantly perhaps, a suitable intellectual atmosphere within which to construct his own version of the growth of civilisation from savage to civilised. Equally importantly, he had the example of his early mentor, Hearn, to guide him, along with the literature on the Australian Aborigines being produced by Howitt and others locally. The social-evolutionary scheme proposed by Sutherland and outlined above may be little more than an amalgamation of already existing ideas; quite possibly however it was the first time those ideas had been synthesised in this way, making it Sutherland's unique contribution to the vast body of anthropological and ethnological literature appearing in the last decades of the nineteenth-century.

SUTHERLAND'S IDEAS ON THE PHYSIOLOGICAL BASIS OF SYMPATHY.

According to Sutherland, leaving aside the still mysterious psychic side of the phenomena, emotions arise from bodily stimuli, and human emotional states are thus the result of 'alterations in the vascular tone
of the body’. For example, an army that is kept warm, well fed and happy will respond more positively to the call to battle and will be more emotionally prepared to fight. This is a simple stimulus-response mechanism but according to Sutherland it is of the sort that lies at the base of human emotions. Though there is a chasm separating the physical from the psychic, what is already known about the interconnectedness of the two should encourage us to follow out the trails of evidence. The location of the emotions lies in the sympathetic nervous system, which was originally used for the adjustment of blood flow in the everyday life of animals. At a simple level this can be seen in fight or flight situations where quick responses to dangerous situations are demanded. Selection would work to improve the system and, over time, more complex behaviour would come under its control. Emotions then are the result of automatic releases of ‘nerve energy by sense stimuli so as to alter the relative calibres of visceral and peripheral blood vessels’. Sympathetic responses are the result of stimulation via the ‘contagion of ordinary emotion’ in other people. The growth of the moral instinct has been based on the development of nerves delicate enough in their susceptibilities thus to react at the sight of another’s pains or pleasures, so as to give at the aspect of joy the happiness of quickened health, at the sight of pain the uneasiness of a lessened vitality.

The survival value of a growth in sympathy lies in the impetus it would give to social feeling. Natural selection would work to select for the more sympathetic types of man ‘better equipped with those qualities which win friends, gain a wife’s devotion and foster a family’s happy affection’. Social bonds based on honesty and unaffected friendliness would subsequently tend to prevail over selfish tendencies which by their very nature would bring about disunity. At each stage of the process the less sympathetic would thus be weeded out.

47 Ibid. volume 2, 211-212.
48 Ibid. 214.
49 Ibid. 216.
50 Ibid. 218.
51 Ibid. 4-5.
52 Ibid. 4
Sutherland saw that his ideas contained a serious problem related to the question of time scales. His ranking of human societies suggested that dramatic progress in the rise and development of sympathy had occurred within a very short time frame; yet his argument depended on the accumulation of naturally selected physiologically based changes. How could such drastic change occur in so short a time? Sutherland tackled the problem by pointing out that if it be assumed that the 'poorer stock' were eliminated at the rate of say 5% in each generation, there would be dramatic improvements in the general population within a relatively short period of time. Wild, dissolute types given to drink and unhealthy lifestyles, or 'unsympathetic' types in the Napoleonic mould would have less chance of marrying and leaving progeny; similarly, sickly individuals and the offspring of unsympathetic types would tend to die early for want of parental care and attention. On the other hand, those with well developed sympathetic responses would be desirable mates and conscientious parents, with the result that their progeny, inheriting their parents biologically based sympathetic traits, would in turn live to reproduce. Throughout his book, Sutherland pushed the view that, in true Darwinian fashion, change was continuous, while in Spencerian terms, the law of progress ensured the future of mankind as an increasingly compassionate and sympathetic social being, for it is clear that this quality of sympathy whose origin was so humble, that in fish and reptile its function was merely to facilitate the hatching of the better types in a world of ceaseless struggle and destruction, has now by perfect continuity to form the basis of the most beautiful of all things that earth contains; a moral nature swayed by impulses of pure and tender sympathy. 53

If Sutherland can now be accused of interpreting the evolutionary process through glasses tinted with Victorian optimism - the highest moral groups are all too obviously those that exhibit the Victorian values of prudence, family cohesion and duty as they were defined by middle class social commentators - it might also be said that his commitment to the evolutionary theory was so complete that he was forced to face up to the prospect that contemporary European society, flag-bearer of the pre-

53 Ibid. 29.
destined Cultured stage of man that it was, was doomed to give way to the higher stages of the process.

THE RESPONSE TO THE MORAL INSTINCT: GALTON TO GINSBERG.

Sutherland's book was well received outside Australia, being the subject of several good reviews. According to his close friend Henry Cyles Turner, Sutherland had 'letters of commendation' from Herbert Spencer, Alfred Russel Wallace, Leslie Stephen and Francis Galton.54 Galton wrote a very favourable review in Nature, praising the 'thoroughly Darwinian' tone and the impressive 'mass of observations which he [Sutherland] has selected without apparent bias'. After outlining the central thesis, that sympathy was the basis of morality and showing how it served as an expansion of Darwin's own work on the subject set out in the Descent of Man, Galton went on to praise the author for producing a 'remarkable' work, all the more so as it was produced under all the hardships consequent with working in the isolation of Australia.55 This was supported by another reviewer, who made the point that the world was still awaiting the appearance of a scientific work of the calibre of Newton's or Darwin's from the new worlds of America or Australia: there is perhaps an irony in this claim, coming as it did more than thirty years after John Fiske's similar comments when discussing Hearn's Plutology. This anonymous reviewer felt that Sutherland's book was evidence that the situation was about to change and a new period in science was about to begin in these 'young, vigorous, active and energetic' countries. It was indeed the first time that an investigator had 'applied to any great department of mind the working of natural selection and sexual selection as set forth by Darwin'.56 Even sceptical reviewers understood this point; one, who felt that it would have been more accurate to entitle it 'The Evolution of Sympathy' still saw it as an important and 'useful' work inasmuch as it would stimulate further research.57

54 Henry Gyles Turner, op. cit, note 5, 28-29.


56 Journal of Mental Science, January, 1899, 163-165.
Beyond the immediate reviews, Sutherland's book had an important impact on a variety of writers and thinkers concerned with interpreting evolutionary theory as it applied to human history and culture. This was especially true in the expanding area of the social sciences such as history, social psychology and sociology. Peter Kropotkin, in his book *Mutual Aid* followed a similar evolutionary format to Sutherland but had a different objective in mind, for he was seeking to enlarge the Darwinian theory to include more emphasis on the factor of co-operation within species as an important instrument of evolutionary change. Whereas Sutherland had avoided discussing the invertebrate life forms in his analysis, choosing to deal only with the origin of sympathy in the lowest vertebrate groups, Kropotkin argued that the co-operative spirit discernible in mutual aid among individuals and groups was evident among the social insects such as the ants. Mutual aid that lay at the heart of Kropotkin's theory of moral development, and he was critical of Sutherland for ignoring invertebrates and criticising the work of Huber, whose investigations of ants provided crucial empirical evidence for the case for mutual aid.58

Elie Metchnikoff, successor to Pasteur at the latter's Institute in Paris was laudatory of Sutherland in his highly popular and much reprinted work *The Nature of Man*, first published in 1903. It was not so much the issue of the moral instinct as such that interested Metchnikoff, however, but Sutherland's defence of colonialism. Sutherland argued that the replacement of savages by the higher races was right regardless of any transitory state of the moral instinct that might cause one to baulk at the process; it was right because it was in line with the inevitable law of evolution under which all the lower stages of humanity were destined to pass away. Metchnikoff took the view that altruistic behaviour ought to be limited to those who share our particular stage of development, for increased knowledge has meant that: 'We have come to disbelieve in humanity in the old sense of the word, so great is the difference between savage and civilised peoples'.59

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The noted psychologist William McDougall was favourably inclined toward's Sutherland's analysis of the origin and development of the maternal instinct, as was the pioneer sociologist and philosopher Edward Westermarck. Sutherland's ideas found a niche in the traditions of British sociology through the work of L T Hobhouse. In his book *Mind In Evolution*, Hobhouse reproduced a number of Sutherland's calculations relating to the fertility of various groups of animals; following Sutherland, Hobhouse interpreted these as showing that the further one travelled up the ladder of life the more fertility decreased, with a greater premium being placed on parental care. At the same time, the growth of complexity at the higher levels testified to the 'greater organisation' of life and 'the curtailment of the struggle for existence'. In a later work on the role of morals in evolution, Hobhouse again followed Sutherland in making mother love one of the founding principles of human social life.

Half a century after Hobhouse's favourable acceptance of Sutherland's work, his own former student Morris Ginsberg, by then one of the major figures in British sociology, returned to the same source as his teacher when seeking a method for classifying the varieties of human society. He was impressed by the range of criteria Sutherland had used in coming to his scheme for ranking human groups, and felt that for this reason, if no other, Sutherland ought to be more widely read. In 1974 the American sociologists Robert K. Merton and Aron Halberstam gave some response to Ginsberg's plea when they reprinted Sutherland's book in the important series 'Perspectives in Social Inquiry'.

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As already suggested, it is difficult now to assess just how much of Sutherland's book was in any real sense original. Many writers made use of the empirical data it contained but ignored the theoretical claims Sutherland was putting forward; others were willing to use both. The book appeared at a time when the subject of moral and mental evolution was much in vogue as a subject for study and it might be seen as just one of a number of similar works appearing around the turn of the century, including those by Kropotkin, Robhouse, McDougall and Westermarck already mentioned. But the intellectual roots of Sutherland's work should be sought on the one hand in the work of Charles Darwin, through the concepts of natural and sexual selection, and on the other in the Victorian confidence in progress in all fields of life, encapsulated in the work of Herbert Spencer. Whatever modern opinion may be as to its lasting merits - and significant parts of it ring a familiar tune to those acquainted with modern sociobiological literature - the book was clearly read and appreciated by a number of important figures in the field of sociology and psychology. Perhaps Greta Jones' rather dismissive attitude towards it needs to be treated with care; certainly it ought not to be merely included, as it is by Jones, with Henry Drummond's *Ascent Of Man* as part of a tradition of 'vulgar evolutionary optimism'. It was, perhaps, that, but it was much more, for the theory that it proposed, made it, by nineteenth - century standards, a sound scientific work. It was thoroughly Darwinian, as Galton saw, and was a deliberate attempt to be so, for Sutherland did not expect to do more than add detail to the sketch Darwin had already painted. As with Fitzgerald's work on orchids, it represented an important attempt to see what scientific capital could be made from applying large and general theories - natural selection for Fitzgerald and both natural and sexual selection for Sutherland - to specific subject areas. If success is to be gauged, in part at least, from the continuing influence of the investigation, then Sutherland must be accorded the epithet of successful.


65 Greta Jones, op. cit. note 39, 46-47.
SUTHERLAND'S OTHER WRITINGS:

(1) THE AUSTRALIAN ABORIGINES

Sutherland’s attitudes towards the Aboriginal population of Australia were mentioned in Chapter 6. In 1888, he contributed one of the two volumes of the historically important survey, Victoria and its Metropolis. The second chapter of this volume was entitled 'The Aboriginal Era' and it once more demonstrated the extent to which Sutherland’s thinking was dominated by continuous, evolutionary change at every level of enquiry. Drawing on the classificatory scheme of human social development which later became so important in his work on the moral instinct, he placed the Australian Aborigines at the lowest stage of savagery, one stage below that which he granted them a decade later. They had no narrated history, something which could emerge only when 'wandering tribes consolidate and own some unifying authority'.66 The primitive nature of their social organisation meant that they had a moral code hopelessly out of step with that of the European settlers, treating nakedness as normal and chastity as irrelevant; this last point was important because the rise of chastity as an ideal was treated as a marker of an advanced social stage in Sutherland’s evolutionary scheme, being a late emerging factor in the development of sympathy and its offshoot, morality.67 The low value placed upon life by the Aborigines was exemplified by their willingness to engage in abortion as a means of birth control; Sutherland granted however that they showed great affection for those children that were allowed to survive.68 All in all, it was a mistake to judge them by the standards we apply to our own cultural peers, for their customs and morals were the result of the dominance of biology over culture. In other words, they were still held in bondage by biological imperatives.69

Sutherland could not avoid the issue of the decline of the Aboriginal races in the face of European invasion. Even granting that

66 Alexander Sutherland, Victoria and its Metropolis, volume 1, (Melbourne: McCarron, Bird & Co., 1888), 15

67 Ibid. 22. Sutherland’s views on chastity as a cultural marker can be found in volume 2 of The Origin and Growth of the Moral Instinct, op. cit, note 38, 149, 180.

68 Alexander Sutherland, op. cit, note 66, 15.

69 Ibid. 22.
the vices and cruelty of the white settlers played a role in the decline of Aboriginal numbers, overwhelmingly it was the biological shackles mentioned above that explained the process.

It may be surmised that there was no great vitality in a race that could so easily be swept out of existence. Such a race, with such customs could never have been numerous, and in spite of a kindly feeling towards them ... we can scarcely regret that scenes of lust and bloodshed have come to an end, and that where ... hours of midnight diablerie once filled the air with lamentations, there is now the decent little church or neat little state school, with human beings that have some ideal to live for and some justification to plead for their existence. 70

What doomed the Aborigines, then, was the fact that as representatives of an earlier stage of man's evolutionary history they had no prospect of advancing. As a race they could not be educated up to the level of the European, for more than anything else they had been left behind by the advances in morality that came with the progress leading to the development of the cultured stage of humanity. The greater use of natural resources and command over the forces of nature clearly demonstrated the superiority of the European races and the gap between the Lowest Savages and the Lowest Cultured was too wide to be bridged by human attempts to accelerate the processes of natural law. The ethics of the question were straightforward enough as Sutherland made clear later in his work on morality

to the sentimental it is undoubtedly an iniquity; to the practical it represents a distinct step in human progress involving the sacrificing of a few thousands of an inferior race. 71

Biology was destiny, and while, at the highest level, sympathy and moral feeling rebelled against the violence of an earlier age, the laws of necessity were iron indeed

Mankind as a race cannot choose to act solely as moral beings. They are governed by animal laws which urge them blindly forward upon tracks they scarcely choose for

70 Ibid. 28

71 Ibid. 29.
themselves. If the divine law leads to an Anglo-Saxon race doubling every half-century, then the same law must intend that they emigrate and expropriate waste lands.72

Sutherland's attitude to the European occupation of Australia reflected the dominant view amongst his contemporaries. As the material presented in the previous chapter showed, the origin of that attitude owed little if anything to ideas of social evolution and the central tenets of Darwinism. What Sutherland was seeking in his analysis of the process of colonial expansion was an explanation that fitted his belief in progress, continuous change and the rule of natural law. His enquiries into the origin of the human moral instinct provided him with the means of constructing such an explanation.

THE OTHER WRITINGS (2) LITERARY WORK

Demonstrating his remarkable breadth of scholarship, Sutherland worked hard to promote the merits of Australian literature. In 1898 he joined with his close friend Henry Gyles Turner in publishing The Development of Australian Literature, a critical review of the writings of Adam Lyndsay Gordon, Henry Kendall (both by Sutherland) and Marcus Clarke.73 The use of the term 'development' in the title was more than merely descriptive; in Turner's introduction it was made clear that Australian literature was to be understood as lacking in quality and depth compared with its European parent. According to Turner, it would reach and perhaps ultimately pass that standard only when 'a national spirit is developed, as it will be unless the traditions of our race suffer decay'.74

Sutherland set about putting Gordon's work into context, praising his artistry but rejecting the dark side of his philosophy because the practical necessities of living made it an unsustainable basis for faith. For 'even if a pessimistic philosophy should eventually be able to justify itself as an ultimate statement of fact, it is inconsistent with the biologic needs of life' and it was not in the national interest that

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72 Ibid. 29.

73 Henry Gyles Turner & Alexander Sutherland, The Development of Australian Literature, (Melbourne: George Robertson & Co., 1898)

74 Ibid. 26.
men should follow Gordon in believing that there was ultimately no
meaning to life. Again, biology came to the fore in Sutherland's
description of Henry Kendall's decline into alcoholism. Kendall's
mother had succumbed to the same disease and Sutherland, echoing the
current belief that alcoholism was a hereditary disorder, urged
sympathy for its tragic victim, who could do nothing against the
biological forces that were arrayed against him, 'Those who look deeply
into the springs of human conduct can see how paramount is the power
of heredity, and it is cruel to his memory to suffer him to be judged in
ignorance of all the facts of his life'.

Few men could claim to have looked deeper into those
springs of human conduct and, in his own attempt at playing the poetic
role, Sutherland revealed the depth of his own philosophy. In his
poem 'With Nature' he expressed his dissatisfaction with traditional
Christian belief and the need to embrace nature as the source of
religious and philosophical feeling; wandering by 'the unbounded sea'
he feels 'An all embracing presence whispering there'. Was this
though a personal presence? There is little indication that Sutherland
felt much confidence in the idea of a life to come, a subject dealt with in
'When Life has Faded'. Rather, it was important that the future of the
race be sought rather than individual survival,

But yet our human race will last,
And earnest work with hand or brain
Will lift it to a higher plane.
And work will stand when we have passed

And so the simple rule is best
To think not of our future place,
But write our mark upon the race,
And leave to God, in trust, the rest.

75 Ibid. 235.
76 Ibid. 268.
77 Alexander Sutherland, *Thirty Short Poems*, (Melbourne: Melville, Mullen &
Slade, 1890).
78 Ibid. 11.
79 Ibid. 15.
The Tennysonian doubt present in so much Victorian poetry is rarely present in Sutherland's work however. A patriotic piece entitled 'The Empire of Our Queen' is full of hope.

For in her name we symbolise
The law shaped life, the sweet home ties,
Wherin we clearly learn to trace
The future premise of our race.

The 'law shaped life' is detailed in a clear and relatively brief outline of the evolutionary and progressive philosophy standing at the centre of Sutherland's attitude to life given in 'The Human Heart and it's Goal'.

And so ten thousand influences
Of happy inspirations
Have joined the streams of life, and these
Flow deep in many nations

And sympathy for sick and sad
Exerts her empire spacious
And arts, like wine that maketh glad
The heart grow ripe and gracious

So do the centuries deepen still
The flow of human feeling
Till far beyond our prophet skill
Our wildest dreams revealing

While the philosophy may be expressed here in the briefest of terms, the narrative of life's long march required far greater effort and length. 'The Birth of Nature' extends to eighty-two verses, making something of a mockery of the book's title. With often painfully detailed rhyme it describes the evolution of the universe and life, from molecule to man, in a poetic rendering of the story already told in The Origin and Growth of the Moral Instinct. The great turning points in the unfolding and evolution of life, large and small, are graphically outlined. One quickly gets the sense that this is a response to that great hymn to Victorian doubt, 'In Memoriam A.H.', but even to the literary tyro it lacks the

80 Ibid. 87
81 Ibid. 120-21.
passion and depth of insight that Tennyson's elegy displays. The laureate tells of a world where faith and hope must predominate, where the final answers will be revealed only 'beyond the veil'. Sutherland's faith is that of the confident enthusiast, lying not in some future state, which may or may not be a possibility, but in the certainty of a law-based consummation of the evolutionary process, which having travelled so far must now lift life to its highest point. Lower Cultured man must now move beyond to the highest stage of all; when sympathy and morality reach their zenith, then will come the time

When nations join as one, and all the earth
Holds one Republic. When in rank or title
In tongue - religion - law - no difference lies

With this prospect spread before him, built on the foundations of the empirical evidence supplied by science as it unravels the trends of life and history, a man should

Delight thyself in fathoming law on law!
Drink heartily thy share
Of all that science wins with creeping care

True enough that 'creeping' is the dominant image, and true too that down the future tracks of time the earth must become a cold and barren globe - the second law of thermodynamics is not to be denied after all - but this is distant prospect. In the meantime the final stages of humanity approach and, with the last vestiges of the earlier stages swept away, usher in a golden age. And of course there is man's duty to be done; to go forward with courage, and to bear up under adversity and the ultimate darkness of the unknown.

CONCLUSION

How is Sutherland's obsessive commitment to evolution as the underlying factor of the material universe to be understood? Clearly he seems to fit into the broad category of scientific naturalism as defined by Frank Turner earlier. The role of Darwinism within that category is a complex and largely unresolved issue, so any discussion of it must be of necessity tentative. Sutherland was Darwinian to the extent that his work across many areas proceeded on the assumption of slow

82 Ibid. 70.
83 Ibid. 80.
continuous change and the role of selection in bringing about that change. But there is also the matter of his commitment to a progressionist interpretation of both biological and social development and his necessitarian belief in the inevitability of further progress. On the face of it this seems to owe more to Herbert Spencer's philosophy than to Darwin's, but there are reasons for questioning such a claim. John Greene suggested over ten years ago that Darwinism in its nineteenth-century form is often best understood by historians as a worldview rather than as a simple formula of biological change centred on natural selection.\(^84\) Greene pointed out that there were a variety of influences feeding into this worldview, many of which owed little or nothing to Darwin but which were shared by many of his supporters and indeed in large measure by Darwin himself. Greene himself drew attention to the similarities between Darwin and Spencer when it came to the general understanding of 'nature, man, God, society and history', and how Darwin accepted the role of progress in human history however much he might have argued against it in his biological work (and even there his opposition was never clear cut as the concluding passages of the *Origin of Species* makes clear).\(^85\)

In a thoughtful and detailed discussion of the relationship between evolution and progress in nineteenth-century thought, Maurice Mandelbaum argues that especially after the work of Comte became well known in Britain the idea of progress became a factor in the discussion of human history and the future prospects of the species.\(^86\) The necessary laws of social development proposed by Comte were seen as a continuation of the same laws in operation in the non-human sphere; it was a short step from that position to linking the biological to the social as was done by Spencer and thus seeing the world as being in a constant state of evolutionary progress at every level. Mandelbaum defines this position as 'total evolutionism', and suggests Spencer as the archetypal example.\(^87\) It would seem that Sutherland too might fit the bill as a total

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85 Ibid. 148.

86 Maurice Mandelbaum, op. cit, note 3, 78.

87 Ibid. 90.
evolutionist sharing a Darwinian worldview of the sort outlined by Greene. Clearly a reader of Darwin, Sutherland also imbibed Spencer, as the many references to his work in the *Origin and Growth of the Moral Instinct* make clear. Perhaps in some ways more importantly Sutherland was a student of Hearn, whose extensive use of Spencer's ideas in his own social evolutionary work must have been influential in helping to frame Sutherland's maturing worldview as a university student. While there are many qualifying 'mights' about this concluding discussion, there does seem to be reason for accepting the view that Sutherland was, from an Australian standpoint, almost peculiarly committed to the Darwinian worldview. While others like Howitt and Fitzgerald accepted and applied evolutionary theory in narrow areas of investigation, Sutherland is probably the only Australian to clothe virtually the entire spectrum of human activity in an evolutionary garb and present it in published form before a largely admiring international audience.
CHAPTER 8

EVOLUTION DIFFUSED:
FROM THE 1880'S TO THE FIRST WORLD WAR

When Darwin died in April 1882, the Age devoted an editorial to an analysis of his impact on science which began 'No Englishman of his day has stood so pre-eminently forward as an enlarger of the boundaries of science; the Newton, so to speak of zoology'. The paper's rival, the Argus, also saw fit to editorialise on the loss of the man who had brought about a complete revolution in men's ideas upon the subjects of ontology, anthropology, and organic nature generally. Nearly twenty years had passed since the two publications had first been engaged in the dispute over the relationship of man to the ape. The truce between them on the occasion of the death of the man responsible for the debate being possible, illustrates the magnitude of the revolution that the Darwinian theory had wrought. In Australia, that revolution was still not complete, though it was well on the way to being so. Doubts still existed in the minds of many about the scope of evolutionary theory and the uses to which it was already being put as an explanation for a wide range of phenomena.

In 1878 W.J. Stephens, a long time teacher of Natural Philosophy at the University of Sydney, chose to use his Presidential Address to the Linnean Society of New South Wales to launch a stinging attack against the rising tendency to see in the theory of evolution a substitute for numerous traditional beliefs. While accepting the value of Darwin's own contribution and the truth of 'the Darwinian doctrine' 'under various limitations', Stephens appealed for the maintenance of belief in design in nature. The 'fanatical Darwinists', especially the German Ernst Haeckel, were promoting through their doctrines of Chemical and Mechanical development and the 'Simial [sic] origin of man' causes of social unrest. Succour was being given to 'passionate and miserable people writhing under the merciless curb of political restraint, and out of whom, when forcibly intermixed with the criminal

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1 Age, 22 April, 1882.
2 Argus, 22 April, 1882.
classes, grow Internationalism, Socialism, and Nihilists.\textsuperscript{3} For all its rhetorical passion, Stephens' broadside reflected the anxiety of those members of society agitated by the growing acceptance of the evolutionary theory as both explanation of, and panacea for, scientific and social ills. Within the scientific community in Australia there was fierce debate about the sufficiency of Darwinism to account for all evolutionary change; for some there was a tendency to reject the notion of design in nature; and for some there was a tendency to parade evolutionary ideas in support of a variety of social objectives. In relation to the last point, it must be said that this was usually in support of radical conservative social theories promoted to clean up social ills through eugenics and race hygiene. Henry Keylock Rusden, a civil servant and outspoken atheist, suggested, for example, that criminals be executed on the grounds that this would eliminate poor stock and over time wipe out crime. (Rusden claimed that in correspondence with Darwin he had received the support of the great man for this project).\textsuperscript{4} While this discussion of evolutionary theory and its wider implications was general around the world it was especially so in the colonies of Australia, first riding on the wave of unprecedented boom conditions in the 1870s and 80s, and then faced with enormous social problems with the depression of the 90s. In the decade before Federation in 1901, Australia was almost a laboratory of progressive social and political thinking; full male and female suffrage, workable labour laws which recognised the rights of unionism, and a general egalitarian ethos.\textsuperscript{5}

So while Stephens' complaint was rather a warning of things to come than a description of actualities, within a decade his worst fears appeared to be eventuating. From being a subject of heated discussion in the previous two decades, evolution was by the 1890s permeating every area of scientific and social life in Australia. Providing at least a partial explanation of why this was so involves

\textsuperscript{3} W. J. Stephens, Presidential Address, Linnean Society of New South Wales, 28th January, 1878, Proceedings of the Linnean Society of New South Wales, 1879, 440.


\textsuperscript{5} For a discussion of this 'progressivist' ethos and its eventual decline see Stephen Alomes, A Nation at Last?: The Changing Character Of Australian Nationalism 1880-1988, (Sydney: Angus & Robertson, 1988).
briefly teasing out some of the threads that were being woven into the fabric of Australian society in the three decades from the early 1880's to the outbreak of the First World War in 1914.

Among events occurring during that period which ensured that evolutionary theory became a more prominent feature of the continent's intellectual and social life some are more easily accessible to historical recall than others. From the standpoint of science itself, there was the appointment of a young group of high-profile academics trained in overseas institutions dominated by biologists, anthropologists and sociologists favouring evolution. William Haswell in Sydney and Walter Baldwin Spencer in Melbourne were certainly the best known among the academic newcomers, but others who were to play a leading part in the life of the colonies in more practical and applied areas of science also arrived at this time.6 William Farrer, breeder of strains of wheat suitable for Australian conditions, arrived in 1870, and the Victorian Government plant bacteriologist, Daniel McAlpine, in 1884; both were committed to applying evolutionary theory in their work.7 Even that most practical and applied of sciences, medicine, came under the influence of evolutionary thought. Dan Astley Gresswell, appointed as Melbourne’s Chief Health Officer in 1890, spoke publicly about the application of the theory of evolution to the understanding of disease, adding his voice to that of another prominent Melbourne medico with Darwinian leanings, James Jamieson.8

At the same time there was an unprecedented degree of interest in secularist and unitarian philosophies, with notable overseas

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visitors, such as Moncure Conway, arriving to address the new faithful on subjects heavily coloured by evolutionary speculation such as racial progress, the relationship of Darwinism to ethics and morality and speculation about the possibilities of life after death. Later, more orthodox religious teachers such as the Scottish Presbyterian, Henry Drummond, seeking to harmonise evolution and Christian revelation, received equally enthusiastic responses. In what may be seen perhaps as a curious footnote, the theosophist Annie Besant toured Australia in 1908, combining what she saw as the best of the doctrines of these two otherwise opposed movements of scepticism and religious renewal.

THE UNIVERSITIES
Within the Universities, the 1880's witnessed a shaking out of some of the older occupants of academic positions, along with the now outmoded programmes they had long promoted. A new group of academics arrived in the Colonies who had been trained by the first generation of post-Darwinian professionals. Symbolising this change was the appointment to the first Chair of Biology at the University of Sydney, in 1890, of William Haswell, who took over the teaching previously done by W.J. Stephens. According to one biographer, Haswell was 'inspired by the teaching of Huxley and C. Wyville Thomson', the latter pushing him into the study of marine zoology. Prior to his University appointment, first as demonstrator then as lecturer, Haswell had been employed at the marine zoological station at Watson's Bay in Sydney working on collections from the Challenger expedition to New Guinea and the marine fauna of Port Jackson. With Thomas Parker he wrote a classic zoological text which eventually went through four editions.

Under Haswell the biology curriculum at Sydney was revitalised and revamped, culminating in a third year of study heavily


10 Besant's lectures in Australia were published as Annie Besant, Australian Lectures,1908, (Sydney: George Robertson & Co., 1908).

11 Patricia Morrison, op. cit. note 6.
oriented towards the theoretical issues of the day. The selection of textbooks reflected this; by 1900 Haswell was recommending Alfred Russel Wallace's *Darwinism*, a popular exposition of natural selection, and Conwy Lloyd Morgan's *Animal Life and Intelligence*, a work oriented to a more Neo-Lamarckian explanation of evolutionary change. In 1906, E. B. Wilson's classic text *The Cell in Development and Heredity* was added to the list followed five years later by David Starr Jordan's *Evolution and Animal Life*, also a Neo-Lamarckian study, but counterbalanced by the addition to the list of Vernon Kellogg's *Darwinism Today*. The use of texts promoting such diverse views on evolutionary theory is a reflection of Haswell's evenhandedness when dealing with theoretical issues, as illustrated by his thoughtful analysis of competing theories of evolution given to AAAS in 1890. It also reflects the importance of those debates within the biological community worldwide between the 1880's and the 1930's. As a writer in the London *Times* described it in 1891, evolutionary biology was 'torn into more sects than the Methodists'.

In Melbourne, a similar transition to that being brought about by Haswell was taking place. In 1887 Walter Baldwin Spencer took up the Chair as first Professor of Biology at the University, relieving Frederick McCoy of part of the duties he had been entrusted with for more than thirty years. McCoy's anti-evolutionary sentiments had permeated both the material he taught and the attitudes he adopted towards teaching. Students had been set examination questions oriented towards eliciting anti-progressive and anti-evolutionary responses. McCoy was not averse to lacing his lectures with ridicule of those whose doctrines he detested, often with results the opposite of those he intended. William Sutherland, for example, could not hide his disgust at hearing McCoy 'thunder against the Darwinian doctrines' when a student at the University in the 1870's.

Spencer came to the job with impeccable evolutionary credentials. At Owens College in Manchester he had been the prize

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12 Sydney University Calendars, 1900, 1906, 1911

13 *Times*, 6 January, 1891.

student of Arthur Milnes Marshall, one of the new breed of Darwinians ‘who came like a fiery apostle, with the new faith of biology’.15 Spencer’s own interest in evolution was quickened, when, in 1885, Henry Moseley and Edward Tylor enlisted him to assist with the enormous task of moving the Pitt-Rivers Collection from London to Oxford and arranging its exhibits in its new site. His later interest in ethnology may have been initially kindled at this time.16 Soon after his arrival in Melbourne, he arranged the appointment of another of Marshall’s students, Arthur Dendy, as lecturer. Dendy was himself destined for an illustrious career, eventually returning to England via professorships in New Zealand and South Africa to take up the chair of zoology at King’s College in London. As the next Chapter will show, he took an active part in discussions on the mechanism of evolution in the early decades of the twentieth-century, promoting a form of Lamarckism.17

Spencer and Dendy effected a radical change in the teaching and research at the University. McCoy had been providing little more than a service course for arts and medical students; Spencer set out to produce specialists in biology who could take advantage of the professional opportunities beginning to open up in both government and non-government arenas. As with Haswell in Sydney, the change from McCoy to Spencer can be seen, spectacularly, in the revamping of the reading lists. Out went John Lindley’s Vegetable Kingdom and William Carpenter’s edition of Cuvier’s Animal Kingdom, standard texts for McCoy’s students for thirty years. In came a variety of practical and theoretical textbooks, including Huxley & Martin’s Biology and Frank Balfour’s Comparative Embryology. Students in third year were directed to Alfred Russel Wallace’s Island Life and Geographical Distribution of Animals along with Darwin’s Origin of Species.18 The inclusion of Balfour’s book reflects the importance given to embryology in the current debates on evolutionary theory; honours students were asked to consider

15 Mulvaney & Calaby, op. cit, note 6, 30.
16 Mulvaney & Calaby, op. cit. note 6, Chapter 4 .
18 Melbourne University Calendars, 188-1900.
'the bearing of the facts of embryology on the theory of evolution.' The two works by Wallace are evidence of Spencer's concern to stress the importance of understanding the geographical distribution of animals and plants, many of them endemic, in a continent as large as Australia. There is some strong evidence to suggest that in the last two decades of the century Australian naturalists and biologists undertook to investigate problems associated with geographical distribution as a means of entering into biological discussions going on overseas. (See Chapter 9).

Spencer and Dendy did not limit their interests to the formal teaching of the University, and both spoke at various times to the University Science Club and College debating societies.\(^{19}\) And while evolution moved into the halls of academia, it also found its way out into the wider society; not always in terms of its technical details, it must be said, and usually in extreme forms or applied to non-biological subjects. It became associated with a variety of nineteenth-century movements such as freethought, progressive or liberal religion, spiritualism, socialism and its antithesis individualism.

Melbourne in the 1880s was the scene of numerous public controversies in science and religion. Set against a political background of sectarian strife over the rights and wrongs of State aid to religious schools, such debates could become heated affairs. In 1883, Charles Strong, the theologically liberal incumbent of the Presbyterian Scots Church, was driven to resign after allowing the politician and journalist George Higginbotham to speak from his pulpit on the subject of 'Science and Religion'. In the course of his talk Higginbotham accused the clergy of all denominations of perpetuating divisions in Christianity and refusing to recognise the truth and power of modern science.\(^{20}\) Strong, along with a group of sympathisers, set up the non-denominational Australian Church, dedicated to serve those who 'have found it impossible to live religiously within the narrow limits of the old

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\(^{19}\) See for example *The Melbourne University Review*, August 6, 1887, page 133, which announces that Baldwin Spencer was booked to address the Ormond College Debating Society on the topic of 'The Evolution of the Australian Animals'. In the same review for May, 1990, Dendy is reported to have spoken at a lecture given by a Mr J. S. Hart on the subject of 'The Borderland Between Plants and Animals'.

theologies and creeds, and who feel that religion is a larger and a deeper thing than all or any of its necessarily changing forms of expression’. The 'Strong Case' became a sensation in Melbourne; the chief issues, viewed from the perspective of Church members, were Strong's refusal to rebut Higginbotham's attack on a number of key Church doctrines, and what was seen as his contempt for the rules of the presbytery in refusing to answer his critics when charged to do so. How much Higginbotham's own acceptance of evolution played any role in the case remains a matter for speculation. Among the liberal members of his own congregation and in the wider community support for Strong was widely expressed. In the scientific community, many took the view earlier expressed by Alfred Howitt, that the clergy were likely to hamper the acceptance of scientific truths and therefore put their own position in some jeopardy by seeming to be out of touch with modern thought. As an example, witness the case of James Stirling. Stirling, a surveyor and member of the Victorian Mines Department with connections with many prominent members of the colonial scientific community, was one of those who later asked Strong to form an independent church. He was a keen disputant, who according to his daughter was always ready to discuss 'the philosophy of Herbert Spencer, Darwin's Origin of Species, and the theories of Professor Huxley with whom [he] had been corresponding for some years'.

Strong's published sermons show a concern for presenting progressive answers to religious and social question of the day. They were prefaced with quotations from modern thinkers - Huxley, August Weismann, and his own theological mentor, Edward Caird, author of a pioneering work on the evolution of religion. Nevertheless Strong was

21 Charles Strong, Christianity Reinterpreted & Other Sermons, (Melbourne: George Robertson & Co., 1894), v.

22 For a discussion of 'the Strong Case' from the perspective of Church members see Aeneas Macdonald, One Hundred Years of Presbyterianism in Victoria, (Melbourne: Robertson & Mullens, 1937), Chapters 8 & 9.

23 See Howitt's comments to his sister Anna May Watts, July 1874, LaTrobe Library, Melbourne, Box No. 10473A (quoted in Chapter 2)


no slavish follower of every scientific fad, and while accepting evolutionary theory when applied to the biological realm was far more circumspect when moving beyond it. In the 1890's, favouring socialism against individualism, he deliberately sided with Kingsley, Marx, and especially Kropotkin against those who would interpret social progress in Darwinian terms of struggle and fitness. 'Whatever may be the law of plants and brutes, the law of human development is altruism and collectivism. Charles Darwin and Herbert Spencer may have discovered the law of brute development, but not of humanity'. In support, Strong quoted from Huxley's Romanes Lecture on 'Evolution and Ethics' the ethical process of society consists not on imitating the cosmic process ... but in combating it'.

In 1883, while the row over Higginbotham's address was still going on, one of the most notable popularisers of the freethought message arrived to give a series of public lectures in Australia. The appearance of the American-born secularist Moncure Daniel Conway brought to reality a scheme hatched in part by the freethinking Henry Gyles Turner, who had extended an invitation to Conway while visiting Britain two years earlier. Years before, Turner had been instrumental in setting up the Unitarian Church in Melbourne, and his sister Martha was resident preacher there at the time of Conway's arrival.

Conway had moved to London from America in the early 1860's to take up the position of incumbent at the South Place Unitarian Church. He soon added Dickens, Browning and Meredith to his list of American friends Emerson and Thoreau. As a student he had been taught by Louis Agassiz and in London he quickly moved into the fashionable scientific circles. In 1878 he collaborated with W.K. Clifford to form the Congress of Liberal Thinkers at his South Place meeting rooms, and succeeded in getting Huxley and John Tyndall to speak. The Congress folded the next year, after Clifford's death, but its successful formation illustrates the point that Conway was part of the broad movement of secularists, free-thinkers, positivists and scientists who fashioned so much of late nineteenth-century social, political and philosophical discourse. An audience with Darwin provided the final

26 Ibid. 86. The quote from Huxley is one of four epigrams Strong placed before the text of his lecture.

27 Turner Papers, LaTrobe Library, Ms.8062 M1681 Personal Memorabilia.
seal of approval to his status, and commentators in Australia could be
forgiven for believing that his visit forged a link between colonial
'progressives' and their more illustrious counterparts 'at home'.

While the tour was a financial failure, it proved to be a
stunning public success. The lectures were well attended, especially
those on 'The Pre-Darwinite and Post-Darwinite World', and 'Woman
and Evolution', where, according to the Argus, the audience included 'a
greater proportion of ladies' than at the speaker's earlier lectures. The
media reported that many of Melbourne's most prominent citizens
attended but gave no details as to who they were. According to Turner,
Robert Brough Smyth arranged Conway's itinerary, and Conway claims
to have met Charles Strong and the broad-church Anglican Bishop of
Melbourne, James Moorhouse, successor to Charles Perry. When he
arrived in Hobart he was the guest of members of parliament as well as
of the geologist R.M. Johnston and the librarian and literary and
scientific figure A.J. Taylor. In Sydney, Conway was the guest of the
liberal Justice Windeyer, whom he described as 'a learned freethinker
and spiritualist', and was invited to 'address the local philosophical and
scientific institution'. His lecture on 'Toleration' in the Protestant Hall
in Sydney was attended by 'the premier, Sir Joseph [sic] Parkes, other
ministers and eminent citizens'. Before this collection of social and
political luminaries Conway delivered a series of lectures, nearly all of
which contained copious references to evolutionary themes.

In 'The Pre-Darwinite and Post-Darwinite Worlds' Conway
outlined the historical background to Darwin's formulation of the theory
of natural selection and the possibilities for the human species now that
man had become conscious of the process. 'Nature's art of war' as
Conway termed it could now be substituted with 'a purposed human
progression of unconscious evolution had brought nature as far as man;


29 Turner Papers, op. cit. note 27.

30 Argus, 13 October, 1883

31 Moncure Conway, op. cit. note 9, 75-6. Turner Papers, op. cit, note 27.

32 Ibid. 80-92. For 'Joseph Parkes' read 'Henry Parkes'.
and now with man begins a conscious evolution, variation by purpose, art and skill'. This was no call to a Rusden-style interference in natural selection with the objective of honing up the process. Conway's scheme envisaged the 'great social forces' of sympathy and compassion for the weak taking over from the brute forces of nature.\textsuperscript{33} In the subsequent lecture on 'Woman and Evolution' he elaborated on his vision of evolutionary progress. The inevitable abolition of war, under the pressure of the new found evolutionary factors of sympathy and compassion, removed the need for brute strength. As Conway saw it; in the past, a form of Darwinian sexual selection had prevailed in which the strongest males had competed for the favours of the weakest (that is, most feminine) females. The laws of heredity then intervened, ensuring the transmission of the respective characteristics of each gender down through the generations. Now, by conscious choice, man had the capacity to overcome the 'necessity' of violence, and as a consequence there would be 'a diminution from the polarised sexism of the present day'. Evolution was making the nature of women more manly and that of man more womanly, thus bringing the sexes closer together and ensuring that woman will grow 'in mind and body'.\textsuperscript{34}

Rejecting supernatural religion, Conway attacked orthodox Christianity for its adherence to outdated dogmas and outmoded attitudes to the natural world. Christianity was an outgrowth of Judaism, itself the product of nomadic wanderers in a harsh desert environment, which caused them to despise the natural world and seek solace in a world to come. Particular religions were the product of a form of 'selection of the credulous', whereby supporters eliminated their opponents and then passed on their own beliefs to their offspring. Gradually these beliefs became 'instinctual'. Religious evolution was only a continuation of the slow and blind progression of nature. From the vengeful God of Abraham, the religious instinct moved inevitably to the humanity of Christ and ultimately to the agnosticism of the sophisticated minds of the present day. Religion became less convincing as an explanation for natural phenomena as science extended its power

\textsuperscript{33} \textit{Argus}, 2 October, 1883

\textsuperscript{34} \textit{Argus}, 13 October, 1883
into more and more realms of human life. Heaven, then, must be built in this world, not expected in the next.35

The Argus devoted an editorial to Conway's visit to Australia, drawing a parallel between the isolation of animal and plant species on islands, which it claimed severely restricted the capacity for change, and the intellectual isolation of continents like Australia from the 'centres of modern thought'. It saw Conway, perhaps somewhat romantically, as a representative of such thought, one of that number of mankind 'who in their respective intellectual departments do the thinking for the world'. With Darwin's theory (which in this instance the Argus was taking in the broad sense of evolution, and not just evolution by natural selection) accepted by all leading naturalists, Conway was doing 'good service' in elaborating its implications across the range of human thought. The editorial went on to praise Conway for pointing out that the addition of 'kindness' to the factors involved in human evolution would mean that those societies which developed the highest social ideals, including charity, would best survive. This the paper thought should be a sufficient answer to those who saw the Darwinian theory as one of pitiless struggle and rejection of the weak.36

Conway's visit went beyond the role seen by the Argus however. He symbolised the eclecticism of nineteenth-century philosophical and social movements and his Australian lectures exhibited strains of all these. He came as the champion of those like Henry Gyles Turner, George Higginbotham and Henry Keylock Rusden, who were 'progressives' insofar as they rejected much of what passed for social and religious orthodoxy without resorting to the radical alternatives associated with, say, socialism. Conway's tour may well have been a success at least to the extent that he attracted large crowds but his message must have had limited long term appeal. The combination of a sophisticated use of current findings in the sciences with an anti-religious polemic would have deterred many enquiring minds, especially those wishing to incorporate the old and the new in a more modern synthesis capable of containing the findings of science and the traditional values of Christianity. Conway might have enrolled evolution in the service of anti-clericalism, social-progress and the

35 Argus, 2 & 9 October, 1883

36 Argus, 6 October, 1883
religion of humanity, but it was in truth a many sided doctrine capable of being marshalled in support of even the most orthodox of religious opinions.

Seven years after Conway's tour the Scottish theologian Henry Drummond visited Australia. Although only thirty nine at the time, Drummond was already a celebrated preacher, and, through his popular book *Natural Law in the Spiritual World*, well known as a Spencerian interpreter of evolutionary religion. As an evangelical, Drummond was committed to reclaiming the 'new man' for Christ, and as an evolutionist, he was equally committed to the idea that in human evolution altruism had superseded the struggle for existence as the key factor of change. The guiding hand in human evolution was an environment dominated and driven by a spiritual and moral force, one that inspired men from within to subordinate their 'lower nature' (the physical side of life) in order to give themselves up to the 'higher nature' (the spiritual life). It was this message which Drummond brought to Australia in 1890.

The original impetus for Drummond's Australian tour had come a year earlier, when 230 members of Melbourne University, some of whom had apparently attended his meetings at Edinburgh as students, issued an invitation and arranged speaking engagements. Because Drummond insisted that his meetings with students be closed to reporters, it is difficult to discover the exact nature and content of his talks and speeches. One can get a fair idea however from the fact that his biographer believed, on the basis of notes left after Drummond's death, that they were mainly constructed from material later incorporated into his book *The Ascent of Man*. Drummond was concerned to discover that a 'large number' of Australians who had once been firm believers in the literal truth of Scripture had lost their faith under the influence of 'infidel writers'. The majority of questions


38 Smith, Ibid. 470-73.

39 Ibid. 366.
he faced in Australia were concerned with 'the reconciliation of the
doctrine of evolution with the statements of the Bible as to man's
creation'. At one meeting in Melbourne he addressed a group of some
200 students, many of whom were 'of a class who never go to church',
while in Sydney he was informed that in a group of 140 doctors who
attended one meeting only 4 were regular churchgoers. He had the
satisfaction of seeing the students in Melbourne 'turn out night after
night', and towards the end of his stay the response was such that he
was forced to undertake 'two or three meetings a day'. After he left for
Sydney a 'Drummond Club' was formed for the purpose of discussing
his work, while 20 of the aforementioned Sydney doctors were said to
have agreed to contribute 50 pounds each per year to establish a 'church
for doctors'.

Drummond began his tour in Melbourne, where soon after
his arrival tragedy struck when an old friend resident in Victoria died
suddenly after contracting typhoid. Invited to give the funeral oration,
Drummond chose the occasion to ponder 'whether the Atonement' was
a 'law of nature' and whether 'the supreme condition of progress, the
sole hope of the future is Christ's law of the sacrifice of self. These
were precisely the questions he was seeking to answer in all his talks.
In the three months prior to his Australian visit Drummond had
delivered a series of seven addresses to students at Edinburgh on topics
as diverse as 'Evolution and Religion', 'Evolution and Christianity',
'Sin' and 'The New Nature'. These later formed the basis of his Lowell
Lectures delivered in Boston in 1893, which were themselves
incorporated into The Ascent of Man. Therefore, if they were, also the
substance of his talks in Melbourne and Sydney then Australian
audiences were privileged to hear early drafts of what was to become one
of the most popular theological works of the late nineteenth-century.

40 Ibid. 371.
41 Ibid. 369-70
42 Ibid. 365.
43 Ibid. 370-72.
44 Ibid. 365-66
As with Conway, so also for Drummond it was evolution that provided the master key to understanding the true meaning of life, human existence and in the latter's case, Christian theology. Evolution was 'the method of both nature and history', and within these two spheres, religion also evolves, by which Drummond meant that the spirit of man also evolves, both in terms of man as a species and man as an individual.\textsuperscript{46} As an individual, man could aid the process by 'looking after his physical body and avoiding sin'. 'You must have an aim to evolve yourself too', he told his Edinburgh audience. Quoting Harriet Martineau, he claimed sin to be 'the subordination of the higher nature to the lower'.\textsuperscript{47} If one aspired to something better 'even to the image of the Perfect Man (Christ), then one could be sure that this would be supported by 'evolution and nature'.\textsuperscript{48} With love being 'the greatest force in evolution', Drummond had no hesitation in defining a Christian as 'a man [sic] who furthers the evolution of the world according to the purposes of Jesus Christ', who was the greatest symbol of love available for contemplation. Of course behind all of nature, and culture, from cell to nation, was God himself.\textsuperscript{49}

Within this broad interpretation of the evolutionary process Drummond was able to incorporate most of the standard evangelical theology of personal commitment to the revealed Christ, a living saviour, while rejecting the primitive speculations of a literal reading of scripture. At times Drummond came close to reading the personality of Christ and indeed the whole Christian scheme, from an entirely evolutionary perspective; reading the New Testament through Herbert Spencer's eyes as it were. As a young man, he had fallen under the spell of the new breed of science spokesmen, particularly Tyndall and Huxley\textsuperscript{50} However, it was precisely this amalgam of religion and science in the form of a sophisticated system, which took Spencer's belief

\textsuperscript{45} The main themes of these lectures are reproduced by George Adam Smith in an appendix to his biography of Drummond, pages 470-99.

\textsuperscript{46} Ibid. 470-73.

\textsuperscript{47} Ibid. 471.

\textsuperscript{48} Ibid. 473.

\textsuperscript{49} Ibid.473-74.

\textsuperscript{50} Ibid.Chapter 5. Science and Religion, 119-51.
in progress and allied it to an established religious tradition, that appealed to so many, including those Drummond addressed in Australia. The similarities with Conway’s message are obvious. Both men saw love as the most powerful force in human evolution and both believed in the inevitable progress of the human species (though Drummond might not have extended this inevitability to the individual). But Conway’s message suffered from being tied to a religion of this world, a humanistic faith that lost favour after the demise of the philosophy of progress of which it was a part in the early years of the twentieth century. The personal nature and otherworldliness of Drummond’s faith freed it from those problems; while its precise form may no longer be in favour with intellectuals within and without the Church, it is probable that many educated Christians today continue to favour some such reconciliation of scientific and religious views.

An example of the extent to which views similar to Drummond’s permeated the established churches in Australia can be gauged from the example of John Edward Mercer, the Anglican Bishop of Tasmania from 1902 until 1914.51 In 1910 Mercer devoted a book to the topic of The Science of Life and the Larger Hope. Rejecting the monism of Ernst Haeckel along with the ‘speculations’ of August Weismann and Herbert Spencer (a significant difference from Drummond), Mercer enthusiastically concluded that ‘the vast evolutionary process, which raises the physical to the mental, the mental to the spiritual, which develops the lower nature of the first Adam into the spiritual nature of the second Adam - that vast evolutionary process is itself to be absorbed into the life of the one eternal, infinite, all-wise, all-loving God, from whom it emanated’.52 Whatever differences in theology there may be between Drummond and Mercer, they are mere nuances when compared with the evolutionary drama that was taken by both to underlie the real meaning of the Christian message. Mercer and his Melbourne counterpart James Moorhouse represented the clerical version of the new representatives of science. It was the Origin of Species that became the turning point in the biological sciences.


inspiring the Haswells and Spencers. For those wishing to hold onto their Christian faith in the face of scientific investigation, works like Essays and Reviews in the 1860s, the writings of Charles Kingsley and others, along with Drummond’s phenomenally successful books Natural Law in the Spiritual World and The Ascent of Man, proved to be both a rock and a clarion call. Combining elements of theological modernism and evolutionary speculation created a palatable, ‘rational’, religion which allowed both faith and reason to be preserved.

THE DOCTORS AND DARWINISM

The introduction of evolutionary theory into the science curriculum at the Sydney and Melbourne universities after the arrival of the new professionally trained, teachers, coincided with an unprecedented growth of Government involvement in areas of practical and applied science. In 1884 Daniel McAlpine, a first-rate mycologist, arrived in Victoria to take up a post as lecturer in biology and botany at Ormond College and the Pharmaceutical College. The colonial government quickly appointed him as Vegetable Pathologist to the Department of Agriculture, where he did important work on the rusts of wheat. Little is known of his formal training except that he studied under Huxley and William Thiselton Dyer. He appears to have been attracted to Darwin’s theory, and in 1880 sent him a copy of his Zoological Atlas, an illustrated collection of sectioned organisms designed for student use. In 1883 McAlpine produced a similar volume dealing with botany, making extensive use of Darwin’s work on plants and material from Huxley’s various textbooks. Among his closest colleagues in Australia was the wheat breeder William Farrer. Farrer was an enthusiastic Darwinian who saw himself applying evolutionary principles to the practical problems of plant breeding. He took as his guides Darwin’s two volume work The Variations of Animals and Plants under Domestication and Alfred Russel Wallace’s Darwinism. According to one source he

53 J. M. Willis, op. cit. note 7.

54 Darwin acknowledges receipt of McAlpine’s book in a letter dated 10 May, 1881 which is held in the LaTrobe Library, State Library of Victoria, Melbourne, Victoria.

appears never to have never been fully convinced of the value of the Mendelian discoveries made after the turn of the century.\textsuperscript{56}

In the medical field the earlier distrust of Darwinism exemplified by the Halford and Huxley dispute of the 1860s began to give way in the 1880s. This was due in large part to two high profile Melbourne practitioners who spoke and published on the relation of evolutionary theory to medical science. James Jamieson, a student of Joseph Lister at Glasgow, arrived in Warrnambool in 1868 where he was appointed Medical officer of Health. Nine years later he took up the same post in Melbourne, and in 1879 was appointed Lecturer in Obstetrics and the Diseases of Women at the University of Melbourne. As his biographer points out, Jamieson was 'a prolific author for both medical and lay audiences'.\textsuperscript{57} This last point is important because it illustrates the manner in which ideas that had been controversial gradually became acceptable at least as subjects for discussion, when served up by a respected authority figure. Through his articles in the \textit{Argus} and \textit{Australian}, Jamieson sought to educate the public on the practical application of medicine to everyday life. But he was equally concerned to portray medicine as a scientific discipline which could be illuminated by, and in turn illuminate, scientific ideas. His knowledge of French and German allowed him to keep abreast of developments in continental science, and in his many forays into discussions of biological theory he showed a strikingly sound grasp of the issues. At times he ventured into highly speculative areas, but always with the idea of encouraging his readers to think seriously about the role of scientific theory and method in the realm of health, hygiene and public policy.\textsuperscript{58}

In 1878 Jamieson read a paper to the Royal Society of Victoria in which he argued that plants and animals show similar respiratory processes.\textsuperscript{59} He made no claim that this fact supported any

\textsuperscript{56} Archer Russell, op cit. note 7, 16 & 77. For a discussion of Farrer's attitude to Mendelism see Mary Cawte, 'William Farrer and the Australian Response to Mendelism', \textit{Historical Records of Australian Science}, volume 6, Number 1, December 1984, 45-58.

\textsuperscript{57} Diana Dyason, op cit. note 8, 2.

\textsuperscript{58} Ibid.

\textsuperscript{59} Ibid.
theory of development, being content to define it merely as 'analogy', but
four years later, writing in the Australasian, he took an explicitly
Darwinian stance when describing the similarities of digestion in plants
and animals. Both plants and animals use their digestive systems to
convert starch into sugar; both are provided with powerful solvents to
aid in digestion. Making especial mention of Darwin's work on
carnivorous plants he pointed out that the success of the order - 350
species in 15 genera distributed in every location around the world -
witnessed to the usefulness of carnivorous behaviour, while at the same
time it brought plants and animals much closer together.60

Jamieson was at his most speculative when discussing
matters at the interface between medical observation and biological
theory. During a lecture to medical students in 1887 on the subject of
'The Influence of Sex in Health and Disease', he suggested that men and
women were at different stages of evolution.61 Using the concept of
'Sexual Selection' from 'Mr. Darwin's great work on The Descent of
Man' he drew attention to several features which suggested that women
were at a higher evolutionary stage than men. As with birds and
animals there had been selection for 'grace and ornament' in the
human species. With droll wit he continued:

'... it has been wickedly said that the pronounced evolutionist is always
looking forward to the happy time when, as the final stage in the progress of the
species, man shall have become a toothless, toeless, hairless biped.'62

Women, possessed of fewer 'hirsute appendages', which were mere
remnants of a necessary covering from a time when human ancestors
lived in trees and caves, appeared to be more highly evolved here too.

While admitting that this may seem a far-fetched notion when reduced
to this sketchy outline, Jamieson believed it fitted the 'terms of the
evolution theory', which 'recommends itself to such a large majority of

59 James Jamieson 'A New Point of Resemblance in the Respiration of Plants and
Animals', a paper read to the Royal Society of Victoria on 13 June 1878 and reprinted as
a pamphlet in the same year under the imprint of the Society.

60 James Jamieson, 'Digestion in Plants and Animals', Australasian, 25 November
1882.

61 James Jamieson, 'The Influence of Sex in Health and Disease', an introductory
lecture to medical students, published in the Australian Medical Journal, April 15,
1887, and reprinted as a pamphlet in the same year by Stillwell & Co., Melbourne.

62 Ibid.6.
the students of natural sciences'.63 And there were other ways in which the evolutionary superiority of women was suggested. Their reproductive apparatus was more highly developed; women had less tendency to vary than men, as demonstrated through such things as the greater propensity of men to be endowed with supernumerary digits; and, more importantly in Jamieson's opinion, women were less prone to display 'hereditary disease'. Women were also better at withstanding disease, while the better survival rate of female babies beyond the first year of life and the well known fact that women on average had longer life-spans than men, pointed to a greater capacity for survival.64 This was a strikingly original departure from the normal nineteenth-century attitude towards the relationship of the sexes, one which often turned to biology to provide apparently objective criteria for assessing possible responses to social questions. In this instance Jamieson was claiming that properly understanding the hereditary component of disease provided the possibility of taking action to prevent it.

Jamieson was intent on forcing upon his students this need to focus their attention on the possibility that evolutionary theory might explain, in some way, long-observed phenomena. While it held out no prospect for improving diagnostic procedures in the short term or in individual cases, such speculation provided the basis for bringing otherwise disparate phenomena into line with current biological theory. As such, it provided the medical practitioner with the opportunity to increase the perception of medicine, both within the profession itself and in the population at large, as a scientific enterprise.

In two articles for the Argus in 1910 and 1911, Jamieson sought to keep his lay readers abreast of recent biological theory. In the first he outlined the evolutionary position adopted by Elie Metchnikoff, successor to Louis Pasteur in Paris. In the second he discussed, dispassionately, the question of the origin of life.65 After pointing out that life was a phenomenon almost impossible to define to everyone's satisfaction, he judged there to be two competing explanations for the

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63 Ibid. 7.

64 Ibid. 10.

65 James Jamieson, 'Metchnikoff's Outlook on Life and Death', Argus, 3 September, 1910, and 'The Origin of Life', Argus, 15 April, 1911.
appearance of life on earth. (He rejected miraculous, instantaneous creation as beyond investigation.) 'Biogenesis', the idea that all life originated only from pre-existing life was the theory supported by common sense and scientific experimentation. 'Abiogenesis', the theory that life originated from non-life, had apparently been disposed of as a credible idea by the researches of Pasteur, Lister and Tyndall. However, Jamieson pointed out that evolutionary theory kept the question open, at least as far as the 'real' origin of life was concerned. The conditions pertaining on earth at remote periods were unknown and non-reproducible; they may well have been conducive to the spontaneous generation of some primitive form of living material. While Darwin had publicly at least 'left the question open', Jamieson pointed out that Huxley had taken the view that in the primordial state of the world abiogenesis might have occurred. The likelihood of life being the result of some non-material vital force was an open question; Jamieson rather facetiously pointed out that whether one accepted a materialistic or spiritualistic explanation for life's origin would depend on one's 'heredity or adaptation'.

Jamieson's friend and colleague, Dan Astley Gresswell, arrived in Melbourne in March 1890 to take up duties as the Medical Inspector of the new Victorian Board of Public Health. As his biographer says 'his handling of the influenza epidemic raging in Victoria at the time won him the gratitude of the Premier, the respect of the medical profession, and the lasting confidence of the public'. Five years after his arrival he was President of the Medical Society of Victoria, and in his Presidential Address to the Society in 1895 took as his topic 'Darwinism and the Medical Profession'. A number of references in the printed text suggest that Gresswell was strongly influenced by the English physician, John Bland Sutton, whose book *Evolution and Disease*, had been published in 1890. A comparison of

66 Ibid. 'The Origin of Life'
67 Diana Dyason, op. cit, note 8.
the address with Bland Sutton’s book confirms this suggestion. It is not
the originality of Gresswell that is the chief issue here, however, but his
at tempting to put before a colonial audience of generally conservative
medical practitioners a series of highly speculative views and opinions
not usually thought of as pertaining to medical theory or practice. And it
is interesting to note that, whereas Bland Sutton was prepared to make
great use of the Lamarckian processes of use and disuse in his analysis,
Gresswell, for whatever reason, steered clear of the topic.

Beginning with a broad review of the status of the
Darwinian theory and its ongoing development, Gresswell moved on to
assess its impact on the intellectual life of the time. Evolution was he
said, ‘a theme which since its memorable birth has been growing and
developing until it threatened to invade and to retain hold of every field of
human thought’. It was a theme requiring ‘the assistance of those who
are seeking to learn the meaning of morbid structure and morbid
function’. Researches in these fields must ‘react on pathology and teach
lessons for us concerning the individual and not less concerning the
community and the State’. Man is the outcome of development from a
simpler form through variation, inheritance and reproduction, he is
therefore a part of nature and the profession ‘must take an interest in
the question’.70 The discovery of intermediate life-forms had led
investigators to abandon the older typological ideas of Cuvier and
Linnaeus in favour of genetic relationship and descent. If any trends
were perceptable in human evolution then it was up to the profession to
use this information to urge on governments the need to act so as to
facilitate further progress.71 Gresswell urged on his listeners the
importance of new evidence for evolution brought to light by the
discovery of the fossil history of the horse and the embryological
researches of Haeckel.72 He moved to dispel doubts raised by Lord Kelvin
and others that the physical evidence suggested an age for the earth too
short for the Darwinian scheme to have brought about the evolution of
life to its present complexity. The fossil record, particularly, provided the
Darwinians with ample evidence for their own views and ‘the

70 Dan Astley Gresswell, op. cit, note 68, 78-9.
71 Ibid. 80-82.
72 Ibid. 88-89.
calculations of the geologist or the physicist ... are not to be received with any marked degree of confidence'.

In the second section of his address Gresswell attempted to sketch out some of the implications of the theory of human evolution were it accepted as being correct. In terms of diet, for instance, the passion for salt may be a vestigial hangover from man's primordial origin in a marine environment. If the profession could work out in any broad sense the form of diet that had evolved with primitive man, then certain ailments might be best treated by adjusting that diet accordingly. In certain cases, it might prove necessary to question the wisdom of cooking certain foods. Skin conditions might be explained by recourse to reversion to earlier stages of evolution. While not all ailments might be explained in evolutionary terms, it was clear that many could be, at least speculatively. Just as in the horse, the occasional over-development of the cannon bones might be the result of reversion to an earlier form of hippus, so might abnormal cartilaginous formations in humans be explained 'by reference to the supposed ancestral condition, when each limb was constituted of cartilages in large numbers'.

Gresswell went on to discuss the role of natural selection, evident in the elimination of the weak and unfit as the result of illness. On the positive side, pain clearly had survival value in that organisms with a heightened sense of it would have a greater chance of escaping death; at the earliest opportunity they would seek to remove themselves from the source of pain.

Both Jamieson and Gresswell were seeking to bring, to their profession and to the wider public audience, the idea that health and disease were factors to be accounted for in evolutionary terms. Understanding what constitutes the best treatment for any given disease might be best served if the principles of Darwinism were taken into account. Perhaps more importantly, both men were attempting to place medicine on the firmer footing of biological theory, while at the same time claiming that medicine itself had a role to play in unravelling the

73 Ibid. 90.
74 Ibid. 121.
75 Ibid. 131.
76 Ibid. 132-35.
evolutionary history of man. Gresswell believed that understanding evolutionary history might lead to the introduction of a system of preventative medicine for the individual. At the same time the state could make use of the new findings when forming policy for the administration of health care. This is perhaps the central issue here; scientific theory might be seen as the lynch pin around which the professional aims of the medical fraternity might be built, and the basis upon which State action might be taken. The increasing momentum of the scientific bandwagon was helping to create and re-create professional disciplines: in medicine, the distinction between the art of medical practice and the science of medical theory had always been difficult to define but in the later years of the nineteenth-century the scientific component in the equation began to assert the dominance it has achieved in the period since. While evolutionary theory would seem to provide little in the way of direct assistance to the profession, the ability to harness broader theoretical questions to the Darwinian wagon gave a form of legitimacy to medicine at a time when faith in science was reaching its height.

CONCLUSION
The diffusion of evolutionary ideas throughout a range of disciplines from the 1880s in Australia was in large part a reflection of a similar process going on overseas. Haswell and Spencer brought to Australia new techniques for doing science and an unabashed willingness to involve students in the dominant theoretical debates of the day. Conway and Drummond came as leaders in the attempt to re-interpret age-old creeds in the light of new knowledge; they perhaps brought little that was new for their more educated listeners, but that was hardly the point. Their presence in the country was, as the Argus noted, a means of keeping the colonial intellectuals up to date with current thought overseas. That government-employed scientists like McAlpine and Farrer should be convinced evolutionists is no surprise; both were recent arrivals from the centre of scientific activity. So too was Gresswell; Jamieson had been in the colony for some time but his background in Glasgow and wide knowledge of continental science made him aware of the extent to which scientific theory could be turned to good use in educating the profession and the public in the wider concerns of medicine and hygiene.
All this makes the material covered in this chapter of particular interest. Here can be witnessed the dissemination of scientific theory to a wide audience and the respectability gained by theories considered highly suspect less than two decades earlier. In its own way, the acceptance of evolutionary theory illustrates the triumph of science as the arbiter of correct knowledge about the world and as harbinger of a better world to come. The enlightenment doctrine of social progress gained a boost from evolutionary theory; in the relatively prosperous Australian colonies the message was well and enthusiastically received.
Towards the end of the nineteenth-century the most visible platform in Australia for discussion of evolution in its various guises and across disciplinary boundaries was the Australasian Association for the Advancement of Science (AAAS) which held its first meeting in 1888.\(^1\)

Here for the first time in the history of Australia scientists both professional and amateur could meet together on a regular basis to discuss their own work and how it related to new advances and current controversies in science around the globe. Scientists who had previously been forced to communicate with their colleagues by mail or occasional inter-colonial visits were now able to gather in large enough numbers to encourage co-operative efforts at promoting science. While many of the older members of the Colonial scientific community were still feted as founding fathers, it is clear from the papers presented to the Association that a marked change in attitude had been effected towards previously distrusted theoretical ideas, and indeed to the process and validity of theorising itself. In terms of the life sciences this must be a reflection in large part of the rise of biological disciplines as potential locations for professional activities, while the number of papers given over to evolutionary interpretation in areas such as mental and sanitary science and even economics attests to the percolation of such ideas through the intellectual life of the community, as detailed in the previous chapter. The high public profile of the Association ensured that ideas discussed at its meetings (themselves open to the paying public) were widely disseminated through the local media.

In its early years, the Association provided a venue for amateurs and professionals and in a tangible sense provided a bridge for the coming together of old and new. The Muellers and McCoys were able to participate alongside the Haswells and Spencers reinforcing the impression that there was a continuity, a handing over of the torch from

\(^1\) The history and development of the Association can be found in Roy M. MacLeod, Editor, *The Commonwealth of Science: ANZAS and the Scientific Enterprise in Australia, 1888-1988*, (Melbourne: Oxford University Press, 1988).
one generation to the next. There can be little doubt however that the Association was very much a product of the new men. The greatest advocate for it was Archibald Liversidge, Professor of Geology and Paleontology at the University of Sydney. Liversidge was a product, in part, of the Royal School of Mines in London, where he studied under both Huxley and Edward Frankland, becoming one of the first in a long line of students to be subjected to what Roy MacLeod has called the 'Huxleyan programme' of reformed scientific education. He brought to Australia the zeal for professionalism in science and scientific education his teachers so publicly displayed and fought for. Along with other new arrivals - William Haswell, Baldwin Spencer, David Orme Masson - Liversidge soon set about building networks across the continent. The more general move towards political federation set the stage for the creation of a scientific association which could represent scientists as a united body and push the need for research, not only in the physical and biological sciences, but in the social sciences as well. From the beginning the Association fostered an interest in history, sanitary science and geography, and set up committees to take stock of the continent's natural resources. In its early years at least, it displayed a dynamism that kept it very much in the public eye, thereby largely serving the purposes of Liversidge and his collaborators.

The papers delivered to the geological and biological sections suggest that the installation of the new guard into the Universities and elsewhere did not lead to an immediate revolution in the nature of the scientific work reported. The old guard was still there and, as many papers showed, their work was still the reference point for much contemporary research; there was not yet the distinction between the naturalist tradition and the experimental approach that historians such as Peter Bowler and Jan Sapp have discerned as occurring in the decades following the re-discovery of Mendel's work. Haswell was to an extent an experimentalist; Baldwin Spencer a naturalist. Both were representatives in Australia of the new wave of biologists trained in post-Darwinian biology and who, thanks to Darwin, took evolution for

2 I am grateful to Roy MacLeod for allowing me to see the unpublished manuscript of his biography of Liversidge, from which this information is drawn.

granted. Nor can it be assumed that the Association acted as a sieve letting through only the correct line and eliminating what was taken to be outmoded. True enough, the younger men did take command fairly quickly but this had as much to do with human mortality as with any desire to wrest control away from the elder statesmen of colonial science. Until at least the turn of the century, too, the Association favoured the participation of amateurs, although the institution of relatively exclusive Research Committees, dominated of necessity by professionally trained 'experts', may have made it easier to adopt such a magnanimous position. Then again, despite the growth of professional scientific positions in the colonies, in absolute numbers the community of teaching and research scientists was still small, and maintaining close links with the 'expert amateur' was perhaps a matter of necessity.

What really set the Association apart from the other scientific societies in Australia was the encouragement it gave to the discussion of theoretical issues. The published proceedings of the local scientific societies suggest that there was an unspoken 'gentlemen's agreement', whereby controversial subjects likely to create internal dissent were eschewed. The only exceptions to this restraint appear to have been in material included in the annual presidential addresses (see for example the comments of W. J. Stephens mentioned in the last Chapter). Such restrictive attitudes were clearly not applicable to a national organisation part of whose raison d'être clearly involved precisely such discussion.

That there was a contrast between old and new in aims and outlook did emerge in many of the proceedings, especially in the early years. This was well illustrated at the Melbourne meeting in 1890, where Mueller, in delivering the Presidential Address, coupled high praise for the achievements of modern science with warnings about the dangers inherent in overhasty theorising. In particular he advised caution when theorising about biological change. Nevertheless, in a general address to the Association, where biology cannot be given more than its fair share of space, it is noticeable that he spends it all on discussion of questions related to evolutionary theory, illustrating that he recognised that these were the most important biological questions of the day. Though mild in tone it is clear that he does not accept evolution theory, but has clearly given it considerable thought. Mueller spoke out against accepting too readily that in the organic realm there was to be
found '... a supposed evolutionary tendency of striving for higher development and further melioration wherever circumstances are favourable [which] arises from uncontrolled impulses, so that nothing is left in stationary distinctiveness'.

Significantly, however, the earlier total rejection of all evolutionary theory by Mueller is missing from this address. While 'we should not be over hasty in construing ideas and evolving theories with a view of universal application', the recently unravelled fossil history of the American horse showed that change occurred, though it could be discontinuous, casting doubt upon the Darwinian doctrine that 'nature non facit saltum'. As Mueller saw it, the posing of 'these momentous questions' associated with evolution theory and its mechanisms provided Australians with the chance to participate in the process of correctly answering them. He warned that 'the world would lose many of its charms to intellectual beholders if observers sink too much into materialistic explanations and speculative reasonings' adding later that his hearers should 'deprecate extending theories beyond what is warranted by trustworthy observation'.

Mueller was addressing here one of the real questions of the day in the biological sciences - the status of Darwin's explanatory mechanism for the process of evolutionary change. From the mid 1880's onward, an increasing number of practicing naturalists and professional biologists expressed their dissatisfaction with the Darwinian dogma of evolution through the natural selection of small continuous variations. Denied by the physicists the time frame needed to explain the evolution of life, and with a palaeontological record stubbornly refusing to yield up the necessary connecting links called for by Darwinian theory, biologists sought for other evolutionary mechanisms. The American school of neo-Lamarckians led by Edward Drinker Cope, the various groups of orthogenesists or linear evolutionists centred around Carl Nageli and later Thomas Eimer and his English disciple J. T. Cunningham, along with the mutationists Hugo de Vries, all made trenchant criticisms of the Darwinian programme of evolutionary change. The defence of Darwinism lay with


5 Ibid, 9.
the biometricians, Francis Galton initially and then his disciples Karl Pearson and W.F.R. Weldon, and a group of naturalists of whom Edward Poulton was perhaps the most prominent. The 'rediscovery' of Mendel's work in 1900 not only led to a redefinition of heredity but in the first decades of the twentieth-century, in the hands of William Bateson and the American Thomas Hunt Morgan, became a potent weapon of those opposed to Darwinism. This fragmentation of evolutionary theorists into 'more sects than the methodists' as a writer in the Times once described it, provided the backdrop against which much discussion of biological matters occurred at AAAS from its inception until the historic meeting of the British Association in 1914.

Mueller's ambivalence about the value of theorising was in contrast to A.P. Thomas's Presidential Address to Section D (Biology) in the same year. Thomas, Professor of Natural Science at Auckland University College and a Fellow of both the Geological and Linnaean Societies of London, chose as his topic various aspects of current biological teaching and gave some time to the subject of museums. He was severely critical of the practice of promoting museums as entertainment houses dominated by the spectacle of collections and repositories of interesting items, rather than developing them as purveyors of information. Thomas believed that museums devoted to science and natural history should illustrate the interconnectedness of living organisms with their environment, especially as this was demonstrated by biological theory. Somewhat bitterly he complains that Darwinism has 'infused new life into the study of biology but does not seem to have extended to Museums ... One would think that the Origin of Species had never entered the doors of a Museum'. Further, he goes on to appeal for the cataloguing of the Australian flora and fauna, complemented by a study of the organism as a living entity, seen 'in relation to its surroundings' and with an analysis of 'the long history of the race'. Widening his scope yet again, he urges that all members of

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6 For a full discussion of these debate see Bowler, op. cit, note 3.

7 Times, 6 January, 1891.

8 A. P. Thomas, Address to Section D, Report of the Second Meeting of the Australasian Association for the Advancement of Science, (Melbourne: The Association, 1890), 103-104.
society should be taught to understand the laws of life in order to live 'in conformity with these laws'. This instruction was to involve all aspects of social life, thereby laying the groundwork 'for the rearing of a vigorous race, a system of mental training which shall regard the physiological requirements of mind and the social relations of communities of men'.

Thomas's suggestion that the broadest understanding of the laws of life should be promoted, was in contrast to Mueller's cautiousness, especially as those laws were clearly perceived by him to be based on Darwinian principles. In similar fashion, the President of Section F (Economics, Social Sciences & Statistics) Robert M. Johnston quoted directly from Darwin's work when speaking to the topic of 'Observations on Current Social and Economic Problems'. Johnston was a scientist and statistician who had done valuable work on the geology of Tasmania. Addressing the problem of why the vast creation of wealth in the nineteenth-century had not led to a diminution of poverty, Johnston argued that wealth-creation led inevitably to the creation of social conditions in which over-population would occur, and to an equally inevitable struggle for existence. Quoting directly from the Origin he turned to Darwin to show that 'in a state of nature almost every full-grown plant annually produces seed, and amongst animals there are few which do not annually pair. Hence we may confidently assert that all plants and animals are tending to increase at a geometrical ratio' and quickly extrapolated from this to human society - poverty was the result of an unrestrained birth-rate amongst the social classes least able to cope with the consequences. Political attempts to ameliorate social conditions merely served to prolong the struggle. Johnston, it should be remembered, had been one of the welcoming party for Moncure Conway, so perhaps it is not surprising that he would take the broadest possible view of the evolutionary process.

Just how far Darwin's ideas had permeated Mueller's own professional territory was made evident when the the New Zealander

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9 Ibid. 106.

10 Ibid. 109.

11 Robert M. Johnston, Address to Section F., Report of the Second Meeting of the Australasian Association for the Advancement of Science, (Melbourne: The Association,1890),156. The quote from the Origin of Species, can be found on page 52 of the sixth edition of 1872.
Thomas Cheeseman, presumably under the Baron's watchful eye, argued to participants in Section D, (Botany), that the plant species Knightia, a member of the Proteaceae, was fertilised by the agency of birds. This ran counter to the orthodox wisdom that the plant was always self-fertilised. According to Cheeseman, it was the honey-eaters that were responsible.

A glance at the flowers will at once show how fertilisation is effected. It is obvious that a bird, when thrusting its head between the styles of a recently expanded raceme in search of the honey, must dust the feathers of the forehead and throat with pollen. And if it should afterwards visit flowers in a more advanced stage, it is quite certain that much of this pollen would be rubbed off on the moist surface of the style, and fertilisation consequently take place.12

The passage is worth quoting in full, because in style and approach it could almost have come from any of Darwin's later botanical works. More to the point, Cheeseman openly intended that the connection with Darwin be made clear. The Knightia case supported Darwin's 'aphorism' that 'nature tells us, in the most emphatic manner that she abhors perpetual self-fertilisation'.13 There is no direct mention of evolutionary theory in this presentation, but Cheeseman, an excellent botanist with an international reputation and some 80 published papers to his name, constantly raised evolutionary questions in his work and there can be little doubt that he intended the investigations reported here to support Darwin's own work on the subject.14

Across in Section G (Anthropology) James Barnard informed participants that the Aborigines of Tasmania had fallen victim to the Darwinian law.

It has become an axiom that following the law of evolution and survival of the fittest the inferior races of mankind must give place to the highest type of men, and that this law is adequate to account for the gradual decline in numbers of the aboriginal inhabitants of a country before

12 Thomas Cheeseman, Address to Section D, Report of the Second Meeting of the Australasian Association for the Advancement of Science, (Melbourne: The Association, 1890), 475

13 Ibid. 476

14 For Cheeseman's life and work see G. H. Schofield, Editor, A Dictionary of New Zealand Biography, (Wellington: Department of Internal Affairs, 1940), 153-4.
Barnard urged that the increase in philanthropy, charity and sympathy so much in evidence at the time was an inappropriate means of combating the 'natural law'. As the discussion in chapter six makes clear, the appeal to Darwinian theory in support of an ideology based on the naturalising of social and moral problems, was a common feature of discussions of racial issues in Australia, as elsewhere, at the time.

Thus from museums to plants, racial purity to primitive society, evolutionary theory (though not always clearly Darwinian theory) had infiltrated its way into scientific work and political and social speculation at the Association. It was to remain a dominant theme for many more meetings yet.

At the Christchurch meeting in 1892, the Association President James Hector, Director of the Geological Survey of New Zealand and once a student of (and in more recent times a correspondent of) Huxley, praised the 'generalisation' of Darwin and Wallace, forcefully adding that it had stimulated many New Zealanders such as Frederick Hutton, Jeffery Parker, and A.P. Thomas to take up the issues raised by evolutionary theory. At the same meeting William Haswell, Professor of Biology at the University of Sydney, highlighted the distinction between the old attitude towards theorising in the biological sciences, represented by the cautious Mueller, and the new approach which looked upon such theorising and the discussion surrounding it, as central to the growth and development of a healthy science. Haswell titled his presidential address to Section D 'Recent Biological Theories'; it was a wide ranging and general survey of a variety of theoretical problems confronting biologists and some of the proposed solutions to them. He expended the larger part of his address to the issue of evolutionary theory, and despite being himself strongly sympathetic to

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the Darwinian theory it was a fair and in many ways generous discussion. Darwin, he said, had wrought a change in the biological sciences, one 'in the nature of an illumination, and the illuminating influence has been theory and more especially theories of descent and modification by natural selection'.\footnote{Ibid, 174.} In his discussion of the controversies then raging over the nature of heredity and evolutionary mechanisms, Haswell dealt in turn with the major figures involved and their proposed solutions to the problem. The latter included the vitalism of Carl Nageli, Thomas Eimer's orthogenesis and Hugo de Vries' ideas of intracellular pangenesis. August Weismann's anti-Lamarckian experiments and his ideas on the germ plasm were also raised.\footnote{Ibid, 175-86. For an almost contemporary discussion of all of these (and other) theories of evolutionary change, see Yves Delage & Marie Goldsmith, The Theories of Evolution, English Translation by Andre Tridon, (New York: B. W. Huebsch, 1912). A more recent discussion which puts the debates in a historical context can be found in Peter Bowler, The Eclipse of Darwinism, op. cit, note 3.} But as well as these major figures Haswell gave his audience an overview of the important, but to many at the time, little known, work of J. A. Ryder on the importance of sexuality in evolutionary development. The paper setting down Ryder's ideas, published in the Proceedings of the American Philosophical Society in the previous year, had 'just come to hand' according to Haswell.\footnote{William Haswell, op. cit, note 17, 186.}

Critical but fair towards all of those whose ideas he discussed, Haswell painted for his audience a picture of a dynamic and exciting biological science, where the difficulties of understanding heredity and the processes of evolution were taxing the minds of all involved. It was an impressive performance; Haswell, domiciled in Australia for fifteen years, showed himself to be abreast of the current scientific debates and well versed in the current literature, making a mockery of the view that physical isolation from the centres of scientific activity meant inevitably exclusion from contemporary debates.

BIOLOGICAL RESEARCH AT THE AAAS: WALLACE AND GEOGRAPHICAL DISTRIBUTION.

Beyond its role as a forum for discussing evolutionary theory and its application to a range of perceived problems, AAAS provided the
opportunity for Australian researchers to lock into universal research interests while at the same time contributing to the unravelling of specifically local problems. The most significant area in which this was so can be considered under the broad rubric of geographical distribution. While Darwin supplied the focus for developing an evolutionary perspective on the causes underlying the distribution of life forms, it was the co-discoverer of the theory of natural selection, Alfred Russel Wallace who became the spur and, to a limited extent anyway, the point of departure for Australian workers in this field.

Wallace's scientific reputation in the late nineteenth-century rested on his massive contribution to what later came to be known as zoogeography. In two influential works, *The Geographical Distribution of Animals* published in 1876 and *Island Life* published in 1880, Wallace proposed that for the sake of convenience the world could be divided up into a finite number of zoological zones with more or less distinct floras and faunas. By correlating the occurrence of closely similar groups of organisms, Wallace believed it would be possible to build up a picture of relationships that could provide evidence of migratory patterns, geological changes and evolutionary processes. Thus, as an example, if the flora and fauna of the island of Madagascar, which included animals and plants unlikely to have survived occasional transport due to an inability to swim, cope with salt water and so on, could be shown to share characteristics with the species of mainland Africa, then there was strong presumptive evidence to suggest that some 'land bridge' must have existed at a former period connecting the two areas, and that the two groups of organisms were, however distantly, physically related. The beauty of the proposition was that it had macro and micro aspects; the first dealing with generalities on a global scale, the second with particulars on a limited local scale.

After a careful analysis of the available evidence, Wallace himself had concluded that the Australian flora and fauna bore no resemblance to that of the Indo-Malay region but had developed separately over a considerable period, prior to which Australia had been connected in some way with the continent of South America. Wallace pin-pointed the northern extremity of the Australasian zoological zone with rare confidence; the now famous 'Wallace Line' running between Bali and
Lombok indicated the farthest southern extension of the Indo-Malay region.\textsuperscript{21}

Australia was a prime candidate for the sort of investigation Wallace had in mind when stating in the conclusion to his major work on the subject that 'much work has yet to be done before the materials will exist for a complete treatment of the subject in all its branches; and it is the author's hope that his volumes may lead to a more systematic collection and arrangement of the necessary facts'.\textsuperscript{22} This large continental landmass contained many different environments and relative to much of the world was considered to be in a far less disturbed state. The implications of this type of research were immense not only in terms of theoretical concerns but for more direct economic and social benefits as well. In a continent where agriculture and rural industry were dominant, it was of no small concern to find out the limits and ranges of animal and plant dispersal. Not surprisingly AAAS too, a leading role in promoting distribution studies.

There are at least eighteen papers listed in the Congress Reports between 1888-1914 dealing directly with animal and plant distribution, but this almost certainly does not give a complete picture. Many papers for which no full text exists appear from their titles to come under the heading of distribution studies. Of the eighteen that were published, eight were Presidential Addresses to Section D. As often stated in the Reports, this was one of the areas where Australian scientists were in a good position to make original contributions to world science. One of the first of these geographical distribution discussions appears in Ralph Tate's Address to the first Congress in 1888, entitled 'On the Influence of Physiographic Changes in the Distribution of Life in Australia'. It was in part stimulated by some of Mueller's work, another example of the continuity between the old and new approaches.

Tate did not claim to be introducing anything new but set out to summarize recent work on distribution in Australia (to which he had himself contributed) with the hope that this would stimulate further research. He points to various areas where original work could be done;


\textsuperscript{22} Ibid. volume 2, 552.
for example on 'the Tertiary flora of the Autochthonian region,' where the
gorge of the Fitzgerald River seemed to promise a good chance of
success.23 He also urged that the immense body of data collected by
Mueller should be rearranged to show the relations between the plant
forms, as was done by Joseph Hooker. He pointed out that Mueller
himself had suggested that one of the major scientific problems waiting
to be solved in Australia was just how 'to draw the species into
physiographic and regional complexes', but that this 'must be the work
of future periods, when climate and geologic circumstances throughout
Australia shall have been more extensively known'.24 As the title of his
paper suggests, Tate was concerned to show how alterations in
continental physiography over time could account for the manner in
which animal and plant species were distributed in Australasia. On the
basis of evidence of geological changes he attempted to begin the task of
piecing together a picture of temporal and spatial changes that would
yield an accurate overview of the causes of diversity within the organic
realm in Australia. Much of his evidence was based on information
about the flora of the continent.

It is my belief that we have sufficient data to co-ordinate the botanical
features with certain physical phenomena, and from which we may
determine the relationships of the respective flora's ... It is a trite
saying of those familiar with the life of the Eremian Region 'No rain,
no flowers; no flowers, no insects', thus implying a co-ordination
between physical phenomena and life and the interdependency between
the plant and the animal so pronounced as to suggest morphological
adaptation for permanent establishment in this region subject to great
climatic vicissitudes.25

Tate divided the endemic plants into three types, to which he gave the
names Euronotion (dominant in the South and Eastern parts of the
continent), Autochthonian (limited to the South-West corner of Western
Australia) and Eremian (dominant in the dry regions centred on the

23 Ralph Tate, Address to Section D, Report of the First Meeting of the Australasian
Association for the Advancement of Science, (Sydney: The Association, 1887), 323.

24 Ferdinand von Mueller, Systematic Census of Australian Plants, (Melbourne:
1882), 8, quoted by Tate in his address, 312.

25 Ralph Tate, Address to Section D, Report of the First Meeting of the Australasian
Association, op. cit, note 23, 324.
Lake Eyre Basin). In this account, Tate's main interest was in the origins of the Eremian flora, but to set his discussion of this in context, he first discussed a problem central to geographical distribution in Australia since Hooker's work; how it came about that the Autochthonian flora of the South Western corner of the continent, assumed to be a remnant of the most ancient of the Australian flora, has survived and remained isolated from the more abundant and more recent flora of the Euronotion vegetation of the eastern part of the continent. In modern times, as he pointed out, this can be explained mainly in terms of differences in rainfall, which is very much higher in the South West than in the near-desert Eremian region, which therefore forms a barrier to migration between east and west. But it was known that the rainfall all over Australia was much higher in earlier geological times; how, then, did the South Western flora remain separate? The answer favoured by Tate was that during the earlier period there was an immense inland lake joining what are now Lakes Eyre, Torrens and Frome which, like the Eremian region which replaces it today, acted as a barrier between east and west. Tate was here giving the current view of the problem discussed by Hooker and Darwin and recounted in Chapter 1. Throughout this discussion, his interest in the relationships of different plant forms, in migrations, in the interrelationships of plants and animals and in the common ancestry of groups, make it abundantly clear that Tate was one of those who took evolution for granted. Not surprisingly, Hooker was given as the source of much of Tate's information and he drew one obvious conclusion - that there was a correlation between climate and geographical distribution.

Recognising the incompleteness of the data, Tate concluded with his appeal for more systematic investigation of the fauna of Australia. Five years later at the Adelaide Congress, the Reverend Thomas Blackburn, echoed Tate's call. Further, he stressed the urgency of detailed surveys, because of all the countries of the world Australia had been less interfered with by humans, a state of affairs not likely to last long. Blackburn pointed to the double-sided nature of the value of such surveys. While it satisfied the scientific curiosity to know the boundaries of genera and species, that knowledge would also help to ensure that man was aware of the consequences if crops and exotic
animals were imported into the country and insect 'pests' killed off without regard to the effect on the wider natural fauna.26

At the Hobart Congress in 1892, Baldwin Spencer as President of Section D discussed the 'Fauna and Zoological Relationships of Tasmania'. Beginning with worms, arthropods and molluscs, Spencer worked his way through the animal kingdom, showing that there was often a close relationship between the Tasmanian fauna and that of Victoria. In the case of molluscs, the greater number of different forms in Tasmania was in line with Wallace's claim, made in his book Island Life twelve years earlier, that, throughout the world, islands, were particularly well stocked with varieties of molluscs though this was not mentioned by Spencer in his address.27 Like Tate, Spencer took evolution for granted; he was looking for relationships both between forms in different locations and between present and fossil forms, and therefore gave prominence to a discussion of migration, and barriers to it, when attempting to explain similarities in forms now widely separated, such as those in South America and Australia.

Spencer's interest in questions of geographical distribution was shared by two of his assistants, Arthur Dendy and Arthur Lucas. Unfortunately Lucas's paper to the 1890 Congress on 'The Geographical distribution of Land and Freshwater Vertebrates in Victoria' was not published, but Dendy, delivering a paper on 'The Cryptozoic Fauna of Australasia' at the Brisbane Congress of 1895 returned to the climatic and physiographic considerations of Tate, concluding with a warning reminiscent of Blackburn's that ecological studies were now suggesting that 'not only will the agency of man result in greatly confusing the problems of geographical distribution, but our cryptozoic fauna must be exterminated in the near future by the wholesale destruction of forests which is now going on'.28

26 Thomas Blackburn, Address to Section D, Report of the Fifth Meeting of the Australasian Association for the Advancement of Science, (Adelaide: The Association, 1893), 446-51.

27 Walter Baldwin Spencer, Address to Section D, Report of the Fourth Meeting of the Australasian Association for the Advancement of Science, (Hobart: The Association, 1892), 82-124.

28 Arthur Dendy, Address to Section D, Report of the Fifth Meeting of the Australasian Association for the Advancement of Science, (Brisbane: The Association, 1895), 119.
At the 1902 Congress in Hobart, the President of Section D, W.B. Benham, Professor of Biology at Otago University, detailed a number of facts about the distribution of earthworms in Australia. After praising Darwin for showing that animals 'are shaped by the earth' and not specially designed for particular environments as suggested by William Paley, Benham turned to Wallace's work on geographical distribution. The distribution of earthworms in Australia supported the contention made in relation to mammals that 'whenever we find a considerable number of mammals of two countries exhibiting distinct marks of relationship, we may be sure that an actual land-connection, or at all events, an approach within a few miles of one another has at one time existed'.29 Two years later in Dunedin the President of Section D, Colonel Legge, also gave cautious support to Wallace when discussing the geographical relations of birds in the Australasian region. Legge had begun his own researches believing that Wallace's delineation of the boundaries separating the Malayan and Australasian regions in his Geographical Distribution of Animals was somewhat artificial. However greater acquaintance with the distribution of birds in the region led Legge to the conclusion that the boundaries were real, as illustrated by the fact that 'families and genera [of birds]...characteristic of the area exactly within those boundaries'.30

However, growing acquaintance with the regional distribution of organisms gave local scientists the confidence to question the work of the overseas experts. As Wallace was so often the spur to investigation, so he became the focus for criticism when Australasian evidence failed to support his ideas. Ralph Tate, in the address dealt with above, had criticised Wallace's time frame for the geology of Central Australia. Baldwin Spencer was critical of Wallace's idea of southern migrations from the northern hemisphere to explain the links between Australia and South America. This point was taken up by the influential New Zealand biologist Frederick Wollaston Hutton, when addressing the question of the origin of the struthious birds of

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30 Colonel Legge, Address to Section D, Report of the Tenth Meeting of the Australasian Association for the Advancement of Science, (Dunedin: The Association, 1904), 218.
Australasia. Hutton was particularly critical of Wallace’s claim that the
group ‘had originated in the Northern Hemisphere in the Cretaceous
period, migrated Southward and later became extinct in the Northern
Hemisphere’. If this had been the way things had happened, then why,
asked Hutton, did the placental mammals not arrive in the continent -
after all they had apparently originated earlier than the birds and if
conditions had suited the latter then they ought to have been favourable
for the former. Hutton proposed that the struthious birds of the region
had originated from flying birds in the South Pacific region, and thus
had a different ancestry from the ostriches of South Africa and South
America. Some key morphological differences between the two groups
supported the claim according to Hutton.31

In 1893 Charles Hedley, a Fellow of the Linnean Society of
London and at the time working at the Australian Museum in Sydney,
retraced the steps taken by Tate in his 1888 Address on the fauna of
different regions of Australia. While accepting Tate’s tri-partite division
of the Australian region into Autochthonous, Euronotion and Eremian,
Hedley sought to divide Eastern Australia into two further divisions,
‘one limited to Tasmania, Victoria and southern New South Wales;
while the second consisted of the very distinct fauna and flora developed
on the coasts of Queensland and northern New South Wales’. Hedley’s
acceptance of Tate’s hypothesis meant rejecting parts of Wallace’s work.
Indeed he appears to have thought very little of Wallace’s analysis of
Australian material. Probably responding to the same issue raised by
Tate, he claimed that there were ‘fundamental errors’ in Wallace’s
interpretation of Australian geology in Island Life, rendering the work
‘of slight value’ when working out the relations of the various areas to
each other.32

If late nineteenth-century Australian scientists were
making original contributions to evolutionary biology, then, it was
largely in the field of geographical distribution. Localised investigations
gained local favour while at the same time feeding into the wider
theoretical debates surrounding the work of Darwin and more especially

31 F. W. Hutton, Address to Section D, Report of the Fourth Meeting of the
Australasian Association for the Advancement of Science, (Hobart: The Association,
1892), 365-66.

32 C. H. Hedley, Address to Section D, Report of the Fifth Meeting of the Australasian
Association for the Advancement of Science, (Adelaide: The Association, 1893), 444-46.
Wallace. It was work that gave a boost to biological studies; the Horn Expedition to northern Australia in 1894 stemmed in part from the perceived need to catalogue and describe the distribution of the fauna and flora of the lesser known regions of the continent, while Dendy's work on the cryptozoa (a term he coined) was not merely descriptive but theoretical to the extent that it dealt with the issue of the distribution of these 'light abhorring animals found under logs or stones'. The new professionalism in Australian science, embraced within the aegis of AAAS, found it's expression at least in part through this sort of systematic study of local natural systems.

AFTER 1900: HEREDITY AND MUTATION
Frederick W. Hutton was President of the Association at the Hobart Congress in 1902, and following on in the tradition set by Tate, Haswell and Hector, took the opportunity to deal with theoretical issues, this time under the heading 'Evolution and its Teaching'. After outlining the development of Natural Philosophy and the rise of theories of evolution, both organic and inorganic, Hutton turned his attention to what he believed to be the key issue - the role of mind and intelligence in evolution. Intellectual evolution was 'like biological evolution, due to competition between different individuals and the action of selection'. In a similar way to Alexander Sutherland, he visualised morality arising from the inheritance of 'sympathy'. This apparently Darwinian interpretation of affairs was in contrast to Hutton's interpretation of the overall meaning of the evolutionary process which he believed to be dependent on the action of an external mind - that is, on the agency of some cosmic purser. Chance, whether depicted in the strong sense of ultimate randomness or the weaker sense favoured by Darwin in which apparently random events were due to laws we are currently ignorant of, played no part in Hutton's scheme. The marks of design were everywhere apparent, and the discovery of the secondary laws (natural


34 Frederick W. Hutton, Presidential Address, Report of the Ninth Meeting of the Australasian Association for the Advancement of Science, (Hobart: The Association, 1902), 13.
selection) which brought that design about did not make it any less purposeful. The purpose of evolution was indeed the highest development of man's moral nature in this the terrestrial realm; one could confidently predict that after death the individual's psychological evolution would continue. Man, at his highest moral stage was the pinnacle of evolution 'The race of life is over, and man has won'. 35

By normal standards, Hutton's address was a little eccentric but it came from a highly respected scientist whose early review of the Origin of Species had been praised by Darwin. 36 Few addresses in the years leading up to 1914 ranged so widely; most dealt with more specific issues. In 1911 for instance the Sydney chemist Frederick Watson called attention to the possible influence of the recently discovered radio-activity on the rate and type of organic mutation in the process of evolution. This was not proposed as an alternative to Darwinian selection or any other current theory but as an additional causal factor in the process of evolution. Watson pointed to the cumulative effect of continued exposure on highly sensitive cells and mentioned some experimental work which had produced 'pathologically monstrous' frogs. Speculating on the conditions pertaining on the primeval earth, Watson suggested that the most primitive organisms would have been water borne and to some extent protected by their surroundings from the potentially lethal rays. Nonetheless enough radiation may have penetrated to cause mutations leading to the creation of a dermal covering or perhaps even the shell covering of the earliest crustacea. 37 Watson's paper reflected current debates across the boundaries of separate disciplines - physics and biology - but was not the only paper that year to do so. Professor C.C. Henderson took for his theme to Section E (History) 'The Mutation Theory of Evolution in History'. Henderson, when dealing with human history rejected the Darwinian gradualism supported by Karl Pearson and the biometricians. Instead he proposed that Hugo de Vries's 'theory

35 Ibid. 29.
36 See David Hull, Darwin and his Critics. (Chicago: University of Chicago Press, 1983). Hull reprints Hutton's review along with the letter from Darwin to Hooker (April, 1866) in which Darwin makes his favourable comments.
37 Frederick Watson, Address to Section C (Geology), Report of the Twelfth Meeting of the Australasian Association for the Advancement of Science, (Sydney: The Association, 1911), 345-54
of mutation [which] assumes that new species and varieties are produced from existing forms by sudden leaps' was a much more promising model. Individuals go through 'conversion experiences' which can totally change their outlook and actions, while history shows that social change is not just due to the transmission and slow modification of tradition but often to radical breaks with it. Despite its promise however, Henderson was reluctant to embrace a biological theory to explain the course of human history.\textsuperscript{38}

In 1913, at the last AAAS Congress before the outbreak of the first world war (in 1914 the Congress was replaced by the 84th Meeting of the British Association in Australia), the Presidential Address to Section D was given by Professor H.B. Kirk of Victoria College in Wellington, on the topic 'The present Aspect of Some Problems of Heredity'. Kirk favoured the idea that acquired characters could be inherited, claiming that the experimental work of W.T. Tower on the potato beetle and that of McDougall on the evening primrose 'shows clearly that the germ-plasm is susceptible of direct modification by the environment'.\textsuperscript{39} At the same time, Kirk showed some sympathy for the type of mnemonic theories proposed by Francis Darwin, Arthur Dendy and others. Kirk was clearly not convinced that Mendelism, with its materialist bias was sufficient to explain all aspects of heredity.\textsuperscript{40} One year later one of the giants of early Mendelian research, William Bateson was to argue before much the same audience that in understanding heredity, Mendelism was everything.

THE AUSTRALIAN MEETINGS OF THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE: DENDY, BATESON AND THE NATURE OF HEREDITY.

While the 're-discovery' of Mendel's work by Correns, de Vries and Tschermak at the turn of the century is often seen in retrospect as the

\textsuperscript{38} C. C. Henderson, Address to Section E, Report of the Twelfth Meeting of the Australasian Association for the Advancement of Science, (Sydney: The Association, 1911),

\textsuperscript{39} H. B. Kirk, Address to Section D, Report of the Fourteenth Meeting of the Australasian Association for the Advancement of Science, (Melbourne: The Association, 1913), 261

\textsuperscript{40} Ibid.
turning point in the understanding of heredity, the fact remains that for
many biologists at the time, the relationship of Mendelism to heredity
and evolution remained problematic until well after the end of the first
world war. The processes through which heredity played a role in the
life of the individual and the species, and in the evolution of new life
forms, continued to be the subject of analysis and speculation by field
naturalists, embryologists, breeders and palaeontologists. As Jan Sapp
has shown, the Mendelian’s ultimate victory in ‘the struggle for
authority’ over the study of heredity was not at all clearly predictable
prior to the early 1920’s. Few biologists outside the Mendelian camp
were prepared to grant to genetic factors the sole and exclusive power of
controlling heredity; for many, such factors accounted for a part only of
the overall process of heredity. The distrust of theories of evolution
shown by some leading Mendelians further exacerbated tensions
between competing interest groups. In this context, it is of some interest
that one of the most forceful claims favouring Mendelian research as
the sole arbiter of knowledge on the nature of heredity was made in
Australia, by no less a figure than the leader of the English school of
Mendelians, William Bateson.

In 1914 the British Association for the Advancement of Science
accepted an invitation from its colonial counterpart to hold its annual
meeting in Australia. Meetings were held firstly in Melbourne, then the
home of the Federal Parliament, and later in Sydney. Bateson was
elected President of the BAAS, and he devoted his Presidential Address
to the general question of ‘Heredity’. In a curious twist, Arthur Dendy,
Baldwin Spencer’s colleague at Melbourne for six years from 1888 until
1893 was President of the Zoological Section. By 1914 Dendy was a
respected biological theorist in his own right and professor of Zoology at
King’s College, London. Dendy’s Sectional Address was entitled
‘Progressive Evolution and the Origin of Species’. While Bateson was
calling all attempts at formulating theories of evolution into question
(though also taking the opportunity to push one of his own, see below),
Dendy was proffering a modified Lamarckian mechanism for the
process. The two positions could hardly be more opposed. Bateson judged
everything by its congruence with the findings of Mendelian

41 Jan Sapp, op. cit, note 3.

42 Brian Smith, op. cit, note 33.
experimental data, Dendy considered the Mendelian characters of secondary importance only and drew from a range of disciplines in an attempt to demonstrate that the individual organism took an active if unconscious role in adapting to its environment and, therefore, in its own evolution. It is worth examining the two positions as exemplars of the confusion that evolutionary theorists found themselves in in the early years of the century.

Dendy began his Address by admitting that while evolution as a doctrine was assured of continuing acceptance by biologists, the particular mechanisms by which the process took place were still the subject of heated debate. He attributed this diversity of opinion to the rise of experimental methods in biology and the fact that increasing specialisation narrowed the breadth of competence of researchers however much it increased the depth of knowledge. Theories were all too likely to be constructed on a limited range of expertise. For Dendy, any explanation of the evolutionary process had to account for three things: that, on the whole, evolution has taken place in a progressive manner along definite and divergent lines; the adaptation of the organism to the environment, and the existence of generally well defined groups called species. The first was fundamental and most of his time was given to it. 'Why do organisms progress at all instead of remaining stationary from generation to generation?' According to Dendy, this problem could be examined anywhere on the evolutionary scale, even at the level of human social evolution. The solution lay in the accumulation of 'surplus energy' corresponding to surplus capital in the case of human social evolution; at every stage in the development of the individual organism there is provision made for the next stage. For example, because surplus energy is often given to the embryo from the parent a little more development may occur before birth than occurred in the parent. The process was likely to be extremely slow, and any change in a given generation extremely small but eventually given enough time, evolution might occur.

How did this process originate? Drawing on Herbert Spencer Jennings' work on the ability of the protozoa to learn by experience, Dendy suggested that the ability to learn was universal

Throughout the animal kingdom, and that with learning came the ability to economise in the use of energy. The key to understanding the progressiveness apparently observable in evolution is therefore, according to Dendy, to be sought in the ability of the individual organism to learn by experience. And the oftener a learning procedure is practised, the easier it becomes, eventually taking on the status of a habit which is then inherited by future generations. The struggle for existence is thus made easier for those organisms which are best able to learn and go on learning. Dendy was aware that, on the face of it, this idea might seem too inclusive; after all why did lower organisms continue to exist if all organisms had the ability to progress through learning? The answer lay in the fact that, for whatever reason, many individual lower organisms, like many individual humans, had 'an inherent incapacity for progress'. Put another way, in any group some of the individuals remain behind while others progress and it is the progressives who contribute to evolution.

While developing the notion of learning at all levels, Dendy sought to show that if evolution has taken place then the idea that 'ontogeny recapitulates phylogeny' follows of necessity from the process. He argued that if each embryo goes as far as its parents and then a little beyond to eventually cause evolution to occur then embryo development must recapitulate phylogeny although not all stages need be reflected in full. In this way 'what was the adult condition at one time becomes an embryonic stage in future generations'. In keeping with Dendy's Lamarckian outlook, this represents a process in which 'the characters of the adult animal are acquired during ontogeny as the result of the reaction of the organism to environmental stimuli both internal and external'.

Discussing the role of Mendelism in understanding heredity and evolution, Dendy urged that Mendelian factors could have at best a restricted influence, for while 'a vast number of characters are inherited in this fashion' experiment suggested that these characters are comparatively trivial, having no particular value in the struggle for

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44 Ibid. 384-6.
46 Ibid. 391.
existence. Similarly, the adaptation of the organism to its environment was not explained by mutation, for mutation 'occurs in all directions', and something more than natural selection is needed to explain how favourable ones might arise. According to Dendy, the explanation lay in the organism's ability to respond to environmental stimuli at every stage of its development. Any resulting change could then be passed on to the next generation, because Dendy did not agree with Weismann's contention that all inheritance had its origin in the germ-plasm. What we see in evolution is the result of the 'gradual self-adjustment of the organism to its environment'. Dendy did not explain exactly how the characters so acquired can be inherited. Because such adaptation was built 'upon a foundation of accumulated experience' the process of heredity must be progressive. Dendy accepted that natural selection was important, but he believed that what James Mark Baldwin had called 'functional selection' was more important. Functional selection occurs when the organism selects, out of a range of possible reactions, that one which will best deal with a situation it is faced with. The process was directly tied to the Lamarckian hypothesis when Dendy quoted Lamarck: 'The production of a new organ in an animal body results from a new requirement which continues to make itself felt, and from a new movement which the requirement begets and maintains'.

How was speciation - the divergence of organisms into distinct species to be accounted for? Dendy accepted the Darwinian view that links disappear over time due to extinction, leaving the continuing groups distinct, each one differing in the manner in which it responds to the environment. This can best be seen in island populations where the origin of new flightless birds is, according to Dendy, clearly due to the fact that new conditions acting on the organism 'lead to the gradual disuse and consequent degeneration of the wings'. This response to environmental conditions must be understood bearing in mind Dendy's view that the organism takes a role in directing its own development, and that the organism is always part of its environment, a radical distinction from an extreme neo-Darwinian account of the same process which would have seen the development of flightless birds in more mechanical terms of selection of fit individuals and annihilation of less

47 Ibid. 393-395.
48 Ibid. 395.
Just how or why an organism would act intelligently, Dendy was unable to say; he was not in favour of postulating some sort of entelechy or soul to account for the process, preferring to admit ignorance in the matter.50

In summary, Dendy was proposing a theory of heredity and evolution which subsumed aspects of Darwinism, embryology and Mendelism under a broader explanatory umbrella which was fundamentally Lamarckian. It was a view that proved to be unacceptable to the majority of Dendy's colleagues. It left too much to be explained and, like other evolutionary theories at the period eventually fell foul of the spectacular successes and claims of the Mendelians, at least so far as the problems of heredity were concerned, and in the longer run of the Darwinians as well. Ironically, Dendy's address came just as one of the leaders of the Mendelian school in Britain, William Bateson, was claiming that the phenomena of heredity could only be understood in terms of the Mendelian factors, and that Mendelism itself threw into question all existing theories of evolution.

It has been said of him that 'Bateson had a gift for choosing problems that in his day were insoluble' and he chose to present just such a problem as the core of his Presidential Address in Melbourne: the introduction of the completely new variations necessary for the evolution of existing forms from very much simpler forms of life.51 Bateson had become disillusioned with the Darwinian notion that evolution resulted from the accumulation by selection of small continuous variations. His own investigations led him to the view that it was discontinuity that predominated, and after the 're-discovery' of Mendel's work in 1900 he threw himself into genetic studies.52 By 1914 he had become the leading figure in British genetics (a term he coined) and sufficiently prominent to be made President of the British Association at the time of its visit to Australia in that year.

49 Ibid. 396.

50 Ibid. 397.


52 For Bateson's attitudes to Darwinism see Peter Bowler, op. cit, note 3, pages 188-195.
Bateson delivered his Presidential Address, which he entitled 'Heredity', in two parts, as the Congress was divided between Melbourne and Sydney, an arrangement which allowed him to deal with two distinct aspects of his chosen topic. The first part, delivered in Melbourne, was an exploration of the implications of Mendelism for understanding heredity and evolution in general, and the second, in Sydney, was an interpretation of what those implications meant for the human species in particular. Bateson began his Melbourne address by giving a broad outline of the history of attempts to understand heredity and the central place that Mendelism now held in that study. Darwin was commended for 'The first full perception of the significance of variation' and for his patient accumulation of facts, but his theory of natural selection was dismissed as being of limited use in modern times since the rise of experimental genetics had opened up new possibilities (or provided information unavailable to Darwin). According to Bateson, the survival of the fittest, while it might apply to the organism as a whole, cannot be used to explain the development of the individual parts of which it is made up, consequently Darwin no longer spoke 'with philosophical authority' on questions of heredity and evolution.53 On the subject of the latter, Bateson was sceptical that any solution was in sight; experimentation suggested that variation was discontinuous and possibly due to loss of Mendelian 'factors' rather than addition. That is, evolution may be the 'unpacking of an original complex which contained within itself the whole range of diversity which living beings present'. Discontinuities arose when some inhibiting factor was, for reasons currently unknown, removed or lost.54 According to Bateson, it was in line with current findings that variation be seen as the result of a re-arrangement or 'change in nature' of existing factors in the organism. As an example he used the great variety of apples, each of which was assumed to be descended from the wild crab-apple; cross-breeding had led to the loss of inhibiting factors and allowed the growth of these varieties.55

54 Ibid. 17.
55 Ibid. 18-19.
For Bateson, the intractible problem which is central to his Address is that evolution from simple to complex forms requires the introduction of novelty, and the mutation of already existing Mendelian factors (genes) did not seem enough. But how could new factors be introduced? He approaches this problem by way of the view of dominance that he favours. For him, dominance was due to the presence of factors but recessiveness was due to the absence of those factors. He uses the example of a pure breeding Crimson King primula which suddenly threw off a salmon form, Coral King, which turned out to be a pure recessive. The Crimson King form could not have been heterozygous or the Coral King forms would have appeared regularly, so this appears to be a genuinely new variation. Bateson sees this as a variation by loss. The Coral form has lost the pair of factors which gave the Crimson form its colour. He favours this theory, despite its rather bizarre consequences, because, although he can see how a factor could be lost, he could see no way for a factor to be added. This leads him to put forward the idea that evolution has, since the beginning, been due to the removal of 'epistatic' factors which 'control, mask or suppress underlying powers and faculties'. This means that although the organisms have been moving from simple to complex in the course of evolution, their genetic make-up has been, in a sense, moving from complex to simple by the removal of these inhibiting factors. The immense number of factors that must have been present in a very small organism in the beginning does not worry him. After all even Shakespeare began as a tiny speck of protoplasm. Nevertheless he does recognize that his theory is rather hard to swallow, and believes that, in fact the time had not yet come for a satisfactory theory of evolution. However, once the problem is recognised, 'variation becomes an insistent oppression' or, as he says later, 'we cannot keep these things out of our heads, though sometimes we wish we could'.

In the Sydney section of his Address, Bateson turned his attention to the application of genetics to human society. He asserted that human characteristics relating to sex, intelligence, liability to

56 Ibid. 15-16.

57 Ibid. 18.

58 Ibid. 14, 21.
disease and so forth were likely to be found to be inherited in strict Mendelian fashion. Thus it did matter who one's parents were, for nature, represented by the genes, clearly predominated over nurture, although nurture, the external conditions, often determined just what factors were expressed. Social amelioration through policies which failed to take account of these facts were therefore unwise; every politician and social planner needed to be trained in the principles of biology. Despite expressing misgivings about the efficacy of eugenic programmes then being vigorously promoted, Bateson warned of the dangers of allowing obvious defectives to breed. On a more positive note, while noting that the majority of men were, as it were, labourers in society, merely carrying on the work needed to keep it going, Bateson pointed to the manner in which civilisation advances when there are occasional variations (in individuals) where some inhibiting factor is lost. As he put it in concluding his Melbourne address earlier 'The great advances of science are made, like those of evolution, not by imperceptible mass-improvement, but by the sporadic birth of penetrative genius'.

CONCLUSION.

As Australia moved towards federation in the 1890s, so Australians, though often separated from each other by vast distances, sought ways to overcome their internal and external isolation. The small but growing body of professionally trained scientists, representatives of the Huxleyan programme of science, came quickly to the fore after the founding of AAAS in the 1880s. As the Muellers and McCoys moved off the scene, they took with them a tradition of science that had been waning for decades previously. Yet they left an inheritance that the new generation eagerly took up; a vast quantity of detailed investigation of Australia's flora and fauna. Men like Tate, Haswell, Thomas and Dendy applied their training to problems that were specifically Australian, though of considerable universal value for science. Of these, it was in the area of geographical distribution that proved most fruitful, and there they were able to stamp their own mark on the growing corpus of evolutionary biology. When the British Association came to Australia in 1914,

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59 Ibid. 30

60 Ibid. 21
demonstrating the imperial links that existed between the centre and periphery, it was in its own way paying its respects to the achievements of Australian scientists.

That evolutionary theory should play a great part in discussions at AAAS from the beginning is no surprise. When Bateson and Dendy played out their roles in 1914, they were, unwittingly perhaps, closing a chapter in Australian science. The battle for a secular science where controversy was based on scientific debates was won; even if the public were still welcome at the AAAS meetings, what they came to hear was the voice of the expert. The great public controversies over evolution were a thing of the past, regardless of what individuals may continue to believe. Now, as the debate between Dendy and Bateson makes clear, it was the mechanisms of evolution that was the issue, not evolution itself.
CONCLUSION

In the eight decades that separated Darwin’s visit to Australia from the Australian meeting of the British Association for the Advancement of Science, Australian society and culture had undergone an extraordinary transformation. From a penal colony Australia had become a federation of states, its political structures and social policies exhibiting for the most part a progressiveness that was the envy of much of the old world. In the 1890s, Australia was looked upon by the outside world as a huge social laboratory for others to learn from. At the same time, there was much discussion in Australia itself of the possibility that a genuine ‘Australian Type’ would emerge, one which threw off the shackles of a degenerating European stock, and which through aggressive policies aimed at stopping racial mixing, would ensure the continuation of an Anglo-Saxon line stronger, fitter and more confident than its forbears.1 By 1914, after the ravages of depression, Australians were themselves less sure of their own future and were again turning to the ‘Mother Country’, England, and strengthening the links with the imperial network. Even as the scientists gathered in Melbourne and Sydney for the meeting of the British Association, the great powers of Europe were facing each other in readiness for the ‘war to end all wars’. The Haeckelian dream of a Teutonic master race bred along Darwinian lines, was to end on the battlefields of Europe, and the philosophy of progress that Darwinism had done so much to legitimise died in the trenches of the Somme.

For Australians, the heroic defeat at Gallipoli and the appalling loss of its own finest, fighting alongside its Imperial allies, ended all hope of an ‘Australian Type’ and threw the country into a retreat from nationalism for decades to come.2 What the Great War signified was the futility of applying to society biological concepts that had no basis in human affairs; in war the fittest manifestly did not survive,

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1 For a discussion of the idea of an ‘Australian Type’ along with some contemporary opinions, see Stephen Alomes & Catherine Jones, A Documentary History of Australian Nationalism, (Sydney: Angus & Robertson, 1991), 46-73.

and from war little ever emerges to suggest that humanity is better for having engaged in it.

But even if the optimism engendered by the idea of progress and the natural law of evolutionary change was, by 1914, about to be swept away, the previous eighty years had seen developments in the sciences that had changed for ever the way humanity viewed itself and its place in the scheme of nature. Science had been transformed into a fully secular enterprise, increasingly turned to as the source of true and useful knowledge. In the biological sciences the triumph of evolution had, in the words of a writer soon after the turn of the century 'compelled [man] to reject the too facile explanations offered by teleological systems and to consider causal explanations as the only satisfactory ones'. Whatever disagreements existed over the actual mechanism through which evolution occurred, no one working in biology seriously doubted that it had occurred. William Bateson may not have been happy with the current state of evolutionary theory in 1914, nor convinced that the time was right for formulating a satisfactory mechanism to explain it, but he did not feel the need to call evolution itself into question.

Australia was a participant in all the great changes that occurred within the biological sciences. Initially it helped build the Darwinian theory through the observations and experiments of its explorers and naturalists. Collectors like James Drummond reported back to their clients, including Darwin and Hooker, thereby helping to build 'centres of calculation' at Down and Kew. Others took a more active role; Gerard Krefft entering into discussion with Darwin and promoting the Darwinian cause in Australia; Alfred Howitt helping to build an evolutionary history of human development; and Robert David Fitzgerald using the Darwinian theory and aggressively suggesting modifications to it. Such examples of active participation, however minor, in the shaping of an evolving Darwinism, have been the basis of two of the major ideas explored in this thesis, namely, the fact that Darwinism was an important part of intellectual life in Australia, and that classifying the development of science at the periphery into defined periods does not

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adequately do justice to either the individuals involved nor to the reality of the situation.

Science at the periphery has an integrity of its own. While by general agreement, science is a universal activity that enrols its practitioners from wherever they may be in pursuit of problems that are universal (or at least global). Australia was and is a 'land of contrarieties' where 'all things are queer and opposite'; there was more chance of making original contributions to some parts of the enterprise of science, especially biological science, in Australia than in most parts of Europe. The third major idea explored here surrounds the work of individuals which in many cases has been all but forgotten in the decades since it was produced. If Australians were working to agendas set elsewhere, this is not to say that they had no original contributions to make. Here it is the pioneering work of William Edward Hearn that comes first to mind. To be able to construct, in a young colony, an evolutionary science of economics that was the object of envy in the very centres of Anglo-Saxon learning, and to be able to extend that to the development of society more generally, was a major achievement. David Symes attempts to respond to Hearn were equally impressive, and his own views on the question of evolutionary mechanisms sophisticated. That Hearn can be said to have begun a tradition of evolutionary speculation in Australia is seen in the later work of his student and disciple, Alexander Sutherland, also the subject of much international admiration. The anthropological field-work of Baldwin Spencer and the enthusiasm of those promoting the study of the geographical distribution of the flora and fauna of Australia are later examples, where a unique contribution could be made to the development of evolutionary theory, whether in relation to the human species or to the organic realm more generally. A less savoury case of the same thing, is the extent to which Australian material was contributing to the construction of a social evolutionary view which had appalling consequences for the aboriginal inhabitants of Australia and elsewhere. What all these examples illustrate is that life on the periphery is not always a bar to international success, and that the 'tyranny of distance' need not make it impossible to take part in the enterprise of knowledge making.
Of course, in terms of the actual debates over Darwinism, what occurred in Australia at times mirrors such debates taking place overseas. Conservative scientific, religious and social critics of Darwinism at first found themselves opposed by small numbers of pro-Darwinians. In the resulting controversies - almost always very public and often acrimonious, the issue lying at the core of evolution for most nineteenth-century citizens was the place of man in the scheme of things. Where the issues were the relationship of man to the apes or the antiquity of the human species, the core arguments were laid bare. But even where the subject was less obviously to do with human origins and aspirations, such as in the case of protoplasm or the nature of science, it was always the consequences stemming from the arguments for and against a given position that kept rising to the fore. As Delage & Goldsmith put it more than eighty years ago, 'if the controversy on the origin of species assumed such a bitter character it was because the close of the debate was expected to settle the questions relative to the origin of man'. Within these debates of course other issues arose. What were the correct procedures to follow in the biological sciences? Should one take up a materialist terminology for science, as Halford wished to do, even at the risk of ushering in the Huxleyan programme of a fully independent and secularised biology? Did the acceptance of evolution threaten one's religious beliefs, or could one, like Bromby, accommodate both? In all such cases the debates exhibited the same features so well documented for other countries in the literature on Darwinism.

4 Ibid. 9.
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