

Psychiatric Contributions from South Africa: Ex Africa Semper Aliquid Novi

DJ Stein

Department of Psychiatry and Mental Health, University of Cape Town, Cape Town, South Africa

Abstract

Given that humans originated in Africa, it is likely that many seminal psychological observations and interventions originate in the continent. Relatively little attention has been paid, however, to more recent African contributions to the scientific fields of psychiatry and clinical psychology. This article notes that a number of major contributions to the understanding of brain-mind disorders have emerged from South Africa in particular. It briefly covers seminal contributions in evolutionary theory, psychotherapy, and neuroscience, as well as conceptual and practical contributions to reconciliation.

Keywords: South Africa; Psychiatry; Clinical psychology; Mental disorders; Evolutionary theory; Psychotherapy; Neuroscience; Reconciliation

Received: 06/04/2012

Accepted: 17/06/2012

doi: <http://dx.doi.org/10.4314/ajpsy.v15i5.39>

Introduction

There seems little question that *Homo sapiens* took his and her first steps on African soil.¹ Given that *Homo sapiens* was and is a highly social species, the first psychological theories, and the first psychological therapies were undoubtedly developed and practiced on African soil, with early San and Khoen traditional healers likely making particularly sophisticated contributions. Today's histories of psychiatry typically begin much later on, perhaps covering work of some of the ancient Africans, such as the Egyptians. Modern textbooks of psychiatry typically pay little attention to the discoveries of latter day Africans.

And yet, those who live and work in Africa have continued to contribute to psychiatry and clinical psychology; out of Africa something new always emerges. This paper undertakes a non-systematic, and perhaps somewhat idiosyncratic review of the literature, and notes a number of seminal discoveries and advances made by those born and bred, or working, in South Africa, in particular. Like their early African forebears, many of these individuals ultimately left Africa for other pastures. Nevertheless, like their forebears, they have left their mark, and the world is richer for their existence.

Evolutionary theory

Given the wealth of hominid fossils and primate life in Africa, it would not be surprising were African authors to have made some contribution to work on evolutionary theory and primate behaviour. Of course, it must be admitted that it was an Englishman (Darwin) and an Australian (Wallace) who were responsible for the development of evolutionary theory, including wonderful descriptions of the expression of emotions in animals.² It is notable, however, that Darwin landed at the Cape of Good Hope during his travels³, and it has been argued that his meeting there in 1836 with John Herschel, who had speculated on evolution just a few months beforehand, played a key role in stimulating Darwin's work.⁴

Arguably the earliest African contributor to evolutionary theory and primate behaviour was Eugène Marais. Marais was active in several fields, including Afrikaans poetry. But in many ways he was the father of ethology; perhaps the first to make detailed field observations of the behaviour of animals, including the Chacma baboon, although his analysis and methods still needed polishing in today's terms.⁵ His descriptions of lowered mood in baboons foreshadowed later work on affect and attachment in non-human primates and its relevance to psychiatry⁶, including work in Africa in these areas.⁷ Marais unfortunately was a morphine addict, and his own depression and ultimate suicide make his observations particularly poignant.

Some years later, Robert Dart and Phillip Tobias made their impressive contributions to paleontology. Dart was

Correspondence

Prof. DJ Stein
Groote Schuur Hospital J2, Anzio Rd, Observatory 7925,
Cape Town, South Africa
email: dan.stein@uct.ac.za

born in Australia, but became the second head of the Department of Anatomy at the University of Witwatersrand. There he described the first fossil evidence for the genus *Australopithecus*, an extinct hominin that is on the direct lineage of humanity.⁸ His student, Josephine Salmons, played a key role, by directing him to the owner of this Taung skull. That Dart was from Australia, and that the fossil was from Africa, were factors that helped ensure that the paleoanthropological establishment, which believed then that man originated in Europe, were loath to accept his findings.⁹ The key discoveries of Robert Broom, a physician and paleontologist, including that of Mrs Ples (the first adult specimen of *Australopithecus*), helped support Dart's claims about the new species.¹⁰

Dart's student, Tobias, ultimately took his place, as third head of the Dept of Anatomy at the University of the Witwatersrand. Tobias analysed bones from a range of African sites, including Olduvai Gorge, where in collaboration with Louis Leakey, he identified, described, and named a new hominin species, *Homo habilis*. This work included detailed research on the brain of *Homo habilis*.¹¹ On home territory, Tobias's writings on race were particularly significant in countering the then dominant apartheid view on white racial superiority. They include identifying myths about racial brain differences, a stance that was brave and significant at the time.¹² While South African scientists have certainly contributed to racist views¹³, it is not clear that physical anthropology influenced apartheid policy¹⁴, and the work of Tobias in particular helped undermine a major premise of the Apartheid regime.

Scientists working in South Africa have continued to make seminal paleoanthropological discoveries, including perhaps the oldest complete skeleton of an *Australopithecus*, and the discovery of a two million year old new hominin species, *Australopithecus sediba*. Remarkably, work on the endocast of the latter species has been able to show *Australopithecus*-like features such as convolutional patterns on the frontal lobes, but also some human-like features such as posterior positioning of the olfactory bulbs.¹⁵ Thus although *Australopithecus* had relatively small brain volumes, there was a gradual neural reorganization of the orbitofrontal region in the transition from *Australopithecus* to *Homo*. Such brain changes undoubtedly contributed to *Homo*'s cognitive-affective skills, but speculatively may also have contributed to other aspects of our neurophysiology, including our unique abilities in endurance running.^{16;17}

Recent archeological discoveries at Blombos Cave, not far from Cape Town, have been particularly exciting.¹⁸ Excavations have revealed a workshop, dating back 100,000 years, where a liquefied ochre-rich mixture was produced and stored in abalone shells. The production toolkit includes bone, charcoal, grindstones and hammerstones. While the exact use of the colourant is unknown, the authors suggest possibilities such as decoration and skin protection. These findings are arguably consistent with the speculative hypothesis that early *Homo sapiens* evolved in an environment where seafood was common, and where nutrients from such food facilitated neocortical expansion; this has led to the prediction that essential fatty acids may

be a useful nutraceutical.^{19,20}

A key factor contributing to the success of African paleoanthropology has undoubtedly included being in the right place at the right time. At the same time, as Pasteur famously noted, fortune favours the prepared mind. Certainly, those scientists who made new paleoanthropological finds have worked hard to position themselves to be in the right place at the right time, so as to be able to see the world in new ways. And they have also worked hard to persist with their views, and to promote their perspectives, despite frequent initial skepticism from the existing scientific establishment.

What are the prospects for future South African contributions in the areas of hominid paleoanthropology and primate studies? It seems likely that there will be continued advances in understanding our evolutionary lineage as well as the underpinnings of primate behaviour. But the key challenge for psychiatry and clinical psychology is to use fields such as evolutionary science and behavioural ecology to provide new insights into the brain-mind and its disorders. There remains significant scope for developing the fields of evolutionary medicine and evolutionary psychiatry further^{21,22}, and hopefully some of the relevant work will be done in Africa, mankind's environment of evolutionary adaptedness (EEA).²³

Psychotherapy

Psychotherapy has multiple historical and geographical roots. At the same time, the average reader is far more likely to mention early 20th century Vienna rather than mid 20th century Johannesburg as the key time and place where modern psychotherapy practice and research emerged. Certainly, while the roots of their disciplines are historically and geographically diverse, many of the key fathers of psychoanalytic therapy lived in Europe, while many of the pioneers of behaviour theory and therapy lived in the United States. Still, it turns out that South Africans have made a remarkable contribution to the world of psychotherapy theory and research.

Perhaps pre-eminent amongst these contributors was Joseph Wolpe, arguably the father of behaviour therapy, and perhaps the first to translate behavioural findings from the animal laboratory directly into the hospital clinic.^{24,25} He developed an interest in posttraumatic stress disorder as a medical officer in the army, and his subsequent postgraduate research at the University of the Witwatersrand focused on animal models of neurosis. Building on the research of Pavlov and Hull he demonstrated that anxious cats could be treated by getting them to eat in the presence of gradually increasing 'doses' of anxiety-evoking stimuli. Following Sherrington, he termed this phenomenon 'reciprocal inhibition', and applied it in the form of assertiveness training, which proved particularly useful in individuals with social anxiety.²⁶

Drawing on the work of others, Wolpe then explored the use of progressive relaxation to treat other anxiety disorders, and coined the term "systematic desensitization". Wolpe made many other contributions, including the development of symptom assessment measures, writing on the neurobiology of behavioural techniques, experimenting with somatic interventions to

strengthen behavioural psychotherapy, and noting the value of "correcting misconceptions" in some patients. His pioneering vision was of behaviour therapy as an applied science that was comparable with other medical interventions, and that carefully specified psychotherapy procedures could and should be rigorously compared using empirical measurements of outcome.

Wolpe was not the only South African, however, who made seminal contributions in this area of work. Arnold Lazarus was perhaps the first author to introduce the term "behaviour therapy", in an article written when he was still a psychology student at the University of the Witwatersrand, and published in the South African Medical Journal.²⁷ Working with Wolpe, he helped produce their classic volume on "Behavior Therapy Techniques".²⁸ He went on to include cognitive techniques into his work, perhaps authoring the first clinical text on cognitive-behaviour therapy.²⁹ He subsequently went on to incorporate a broad range of techniques into his "multimodal therapy", which includes an emphasis not only on behaviour and cognition, but also on affect, sensation, imagery, interpersonal relationships and drugs/biology.³⁰

While Wolpe and Lazarus conducted much of their work in the United States, at around the same time, other South Africans, including Jack Rachman (a student of Wolpe at the University of the Witwatersrand) and Isaac Marks (who had graduated from the University of Cape Town) were working in the United Kingdom. Rachman played a key role in initiating behaviour therapy in Europe, and both made major contributions to our understanding and treatment of the anxiety and obsessive-compulsive disorders.³¹ Notably, Marks also developed a nurse behavioral psychotherapist training program, developed computer-assisted self-help programs (that can be used in primary care settings), and played a key role in creating an important consumer advocacy network ("Triumph over Phobia"); so addressing important public health aspects of these conditions. Other South African expatriates have also made key contributions to the development of behavioral and cognitive-behavioural therapies.³²

South Africans have not, however, contributed solely to behavioural and cognitive-behavioural therapies. Julian Leff, an English born psychiatrist who spent time working in South Africa has made crucial contributions to family and social interventions in psychotic disorders.^{33,34} Rollnick, a South African psychologist, played a key role in the development of motivational interviewing³⁵, a set of tools that has been adopted across the globe, particularly for the treatment of substance use disorders. Although there have been few formally recognized psychoanalytic training institutes in Africa³⁶, psychoanalytic theory has informed some liberation theories in Africa (consider, for example, the work of the psychiatrist and revolutionary, Frantz Fanon), and South Africans have also made key contributions to psychoanalysis; this includes those working to clarify and expand classical theory^{37,38}, as well as those working at the intersection of psychoanalysis and fields such as anthropology³⁹ and neuroscience.⁴⁰

Several factors may have contributed to the burst of psychotherapeutic energy in South Africa during the mid 20th century. Perhaps some degree of geographical

isolation allowed creative young minds to go in new directions. And then once individuals with new ideas left South Africa and were able to interact with a critical mass of colleagues and students abroad, they were able to blossom further. Maintaining just the right degree of distance from established scholars and paradigms may be useful for young scientists; too close may make it hard to consider real changes, too far runs the risk of being isolated from support and from influence.

What are the prospects for future contributions from South Africa in the area of psychotherapy? Perhaps there are unique opportunities for future advances in psychotherapy at the intersections of psychotherapy and culture, or at the intersections of psychotherapy and task-shifting.^{41,42} Although there are those who argue that older theoretical frameworks remain relevant⁴³, there may be advantages to following Wolpe's emphasis on conceptual and empirical rigour, as well as Lazarus's willingness to be technically eclectic going forwards. An integrative approach that is able to incorporate past advances, and at the same time align with ongoing developments in our scientific understanding of the brain-mind and research on the psychotherapies, seems particularly attractive.^{44,45} Hopefully the South African context will continue to prove fertile in encouraging innovations and advances.

Neuroscience

One South African who made a crucial contribution to modern brain research and practice is Alan Cormack, winner of the Nobel Prize for Medicine for the development of the theoretical underpinnings of the CT scanner.⁴⁶ Modern structural and functional brain imaging have provided unique insights into the brain-mind and its disorders. It is important to note that Cormack's work was initiated at the University of Cape Town and Groote Schuur Hospital in 1956, developing from the X-ray crystallography work of his mentor, the great physicist RW James, leading to two papers in the Journal of Applied Physics in 1963 and 1964, and foreshadowing the first CT scanner built by Hounsfield in 1971.

With some degree of license, it may be relevant to mention the contributions of a number of other South African Nobel Prize winners, for work in molecular biology, in the context of neuroscience. After all, given that more than half of our genes are expressed in the brain, and many exclusively so, contributions to molecular biology will ultimately be key for understanding the brain. Sidney Brenner, a graduate of the University of the Witwatersrand and Aaron Klug, also a student of RW James at the University of Cape Town, both working in the United Kingdom, made seminal contributions to the foundations of molecular biology, and in so doing helped lay the foundations for modern molecular neuroscience.

Unfortunately, the community of neuroscientists working in South Africa has been a relatively small one. Nevertheless, a number of South Africans born or trained basic or clinical neuroscientists, neurogeneticists, or cognitive scientists, have achieved prominence abroad, contributing internationally, and so influencing these fields beyond the borders of the country.⁴⁷⁻⁵⁴ Particularly eminent is Ting-Kai Li; he was born in Taiwan, but

completed high school in Johannesburg; and subsequently went on to train in medicine, do groundbreaking research on the neurobiology of alcoholism, and head up the National Institutes on Alcohol Abuse and Alcoholism in the United States. Going forwards, of course, the hope is that there will be sufficient infrastructure and resources locally, to support a vision of a productive South African neuroscience, including a transformed body of neuroscientists.^{55,56}

Several factors may have contributed to the success of Alan Cormack.⁴⁶ That he had a solid grounding in physics, mentoring from RW James, a post at the University and time to undertake research, emphasizes the importance of the key training and enabling environment provided by good academic institutions. The fact that his work began in response to a clinical problem faced by doctors at Groote Schuur Hospital emphasizes the importance of the interaction between scientific theory and the real world; clinical phenomena are important not only in their own right, but also as key drivers of the scientific process.

There are important basic and clinical challenges, but also opportunities, for neuroscience in South Africa that bode well for the future. At a basic science level, we have a range of different species that provide many opportunities for future research.⁵⁷ At a clinical level, we have access to some extraordinary populations (including populations that descend from the most ancient Africans, and populations that have descended from relatively few founder families)⁵⁸ and diseases (including conditions such as Urbach-Weithe disorder, which provides a unique opportunity for studying amygdala function).⁵⁹ Giving the growing burden of disease worldwide due to neuropsychiatric diseases, it is important that South Africa has home-grown basic and clinical neuroscience expertise which can then participate in addressing this burden.

Reconciliation

A key part of primate life revolves around the politics of social life, including conflict and reconciliation.⁶⁰ For thousands of years, hominid species have collaborated, colluded, and clashed. Presumably there have been many great human masters in this key area over thousands of years. And South Africa's political history has provided the context for several additional brilliant exponents of the science and art of human negotiation.

Perhaps the best know of these are Mahatma Gandhi and Nelson Mandela. Although born in India, it was in response to injustices in South Africa that Gandhi began to develop his philosophies of non-violent civil disobedience while he lived in Natal. Whether or not this approach is always optimal, Gandhi's teaching that "an eye for an eye makes the whole world blind", is one that we need to take seriously. Evolution may have wired human and non-human primates to have the capacity to forgive and reconcile, but only a few individuals have been able to persuade whole nations to do this.

And Mandela is arguably the greatest of these individuals; demonstrating true genius in the way he helped bring about resolution and reconciliation in the aftermath of apartheid. And key to this genius was a remarkable understanding of human psychology; instantiated in

examples such as Mandela's donning of the Springbok rugby jersey at a time when many others who had participated in the struggle were unwilling to support the predominantly white team.

Gandhi and Mandela's contributions to resolving conflict have been immense, changing the history of the world, and affecting the lives of millions. But there have been a number of other notable contributors, including the South African Nobel Prize peace prize winners Albert Luthuli, Desmond Tutu, and FW de Klerk. And we should not neglect emphasizing the psychological insights into issues of love and hatred provided by our novelists, including Nadine Gordimer and JM Coetzee (both winners of the Nobel Prize for literature), and our thinkers such as George Ellis (winner of the Templeton Prize for his contributions at the intersection of science and religion).

The South Africa Truth and Reconciliation Commission (TRC), led by Tutu, is arguably one of the most important experiments in the psychology of forgiveness and of change. This experiment provided enormous insight into the nature of perpetrators and of survivors, as well as acknowledgment of the suffering of many. Like any experiment it also had important limitations; certainly, not all were helped. However, on balance, it might be argued that the TRC provided both knowledge and acknowledgment to many.⁶¹

Indeed, in recounting some of the contributions of psychiatry and psychology from South Africa, it is important not to be overly hagiographic. Together with the good, there has been much evil. The TRC revealed a good deal not only about the circumstances and individuals that allowed apartheid to be fought, but also about the social and individual context of perpetrators and of bystanders who helped apartheid to persist. Unfortunately, as documented by the TRC, the mental health profession as a whole, and individuals within the profession, have at times been guilty of important human rights violations. Some activists, such as the neuropsychiatrist Frances Ames, did fight with determination to set try put the profession on course. Hopefully, processes such as the TRC, and legislation such as the Mental Health Care Act of 2002, have contributed to ensuring that such violations will be prevented going forwards.

Conclusion

South Africa is a country that currently has a few hundred psychiatrists, and a few thousand clinical psychologists. Just by their numbers, it would be surprising if they had made a large number of original contributions to these fields. Nevertheless, a number of important contributions to basic and clinical neuroscience have emerged from South Africa (indeed space does not allow a full listing of the many eminent South Africans who have made contributions around the world). If one uses poetic license to expand the number of potential contributors, both historically (to include the unpublished psychological masters of the past) and across disciplines (to include those in fields ranging from molecular biology, through general psychology⁶², and on to politics and the arts), then there have been considerably more contributions (only a smattering of which are noted here).

These non-systematic notes on contributions to psychiatry and clinical psychology from South Africa lead to many more questions, which go beyond the scope of a brief article. What, if any, are the common individual, social, and perhaps African factors that have facilitated the pioneering contributions to psychiatry and clinical psychology noted here? What, on the other hand, can be done to avoid the egregious and erroneous pathways that have been taken by local scientists and clinicians in the past?^{13,63} What can academic and health institutions, scientific and philanthropic funders, and society at large do to encourage ongoing and future seminal contributions to psychiatry and clinical psychology?⁶⁴ What can be done to encourage a set of South African pioneers that is reflective of our demographics, in these key areas in the future? This article provides some preliminary observations that may be relevant to answering these questions; further work is needed to delineate more comprehensively the factors that have encouraged important work from South Africa, in order to help maximize the possibility of future successful efforts.

Acknowledgements:

Thank you to George Ellis, Lynn Gillis, Grahame Hayes, Isaac Marks, Alan Morris, Howard Phillips, Leslie Swartz and Terry Wilson for comments on the draft manuscript.

References

1. Reed FA, Tishkoff SA. African human diversity, origins and migrations. *Current Opinion in Genetics & Development* 2006;16:597-605.
2. Darwin C. *The Expression of Emotion in Man and Animals*. London, John Murray, 1872.
3. Hopper SD, Lambers H. Darwin as a plant scientist: a Southern Hemisphere perspective. *Trends in Plant Science* 2009;14:421-435.
4. Warner B. Charles Darwin and John Herschel. *South African Journal of Science* 2009;105:432-439.
5. Morris AG. Zuckerman versus Marais: a primatological collision. *South African Journal of Science* 2009;5-6:238-240.
6. Harlow HF, Stollnitz F. *Behaviour of Nonhuman Primates*. London, Academic Press, 1965.
7. Sapolsky RM. *Why zebras don't get ulcers*. New York, NY, Basic Books. 3rd edition, 2004.
8. Dart RA. *Australopithecus africanus: The Man-Ape of South Africa*. *Nature* 1925;115: 195-199.
9. Dart RA, Dennis C. *Adventures with the Missing Link*. New York, Harper & Brothers, 1959.
10. Findlay GH. Robert Broom FR.S. *Palaeontologist & Physician 1866-1951: A Biography, Appreciation, and Bibliography*. Cape Town, AA Balkema, 1972.
11. Tobias P. The brain of *Homo habilis*: A new level of organization in cerebral evolution. *Journal of Human Evolution* 1987;16:741-761.
12. Tobias PV. Brain-size, grey matter and race: Fact or fiction? *American Journal of Physical Anthropology* 1970;32: 3-25.
13. Dubow S. *Scientific racism in modern South Africa*. Cambridge, Cambridge University Press, 1995.
14. Morris AG. Biological anthropology at the Southern tip of Africa. *Current Anthropology* 2012;53S5, 152-160.
15. Carlson KJ, Stout D, Jashashvili T, de Ruiter DJ, Tafforeau P, Carlson K, et al. *The Endocast of MH1, Australopithecus sediba*. *Science* 2011;333: 1402-1407.
16. Noakes TD, Clair Gibson A, Lambert EV. From catastrophe to complexity: a novel model of integrative central neural regulation of effort and fatigue during exercise in humans: summary and conclusions. *British Journal of Sports Medicine* 2005;39:120-124.
17. Stein DJ, Collins M, Daniels W, Noakes TD, Zigmond M. *Mind and muscle: The cognitive-affective neuroscience of exercise*. *CNS Spectrums* 2007;12:19-22.
18. Henshilwood CS, d'ÖErrico F, van Niekerk KL, Coquinot Y, Jacobs Z, Lauritzen SE, et al. *A 100,000-Year-Old Ochre-Processing Workshop at Blombos Cave, South Africa*. *Science* 2011;334:219-222.
19. Erren TC, Erren M. Can fat explain the human brain's big bang evolution? *Horrobin's leads for comparative and functional genomics. Prostaglandins, Leukotrienes and Essential Fatty Acids* 2004;70: 345-347.
20. Horrobin D. Lipid metabolism, human evolution and schizophrenia. *Prostaglandins, Leukotrienes and Essential Fatty Acids* 2005;60: 431-437.
21. Nesse RM. An evolutionary perspective on psychiatry. *Compr Psychiatry* 1984;25:575-580.
22. Stein DJ. Evolutionary theory, psychiatry, and psychopharmacology. *Progress In Neuro-Psychopharmacology & Biological Psychiatry* 2006;30:766-773.
23. Bowlby J. *Attachment*. New York, Basic Books, 1969.
24. Poppen R. *Joseph Wolpe*. New York, Sage, 1996.
25. Stein DJ. *Joseph Wolpe (1915-1997): A pioneer of modern psychotherapy*. *S.Afr.Med J* 1998;88:335.
26. Wolpe J. *Psychotherapy by Reciprocal Inhibition*. Stanford, Stanford University Press, 1958.
27. Lazarus AA. *New methods in psychotherapy: a case study*. *SAMJ* 1958; 32:660-664.
28. Wolpe J, Lazarus AA. *Behavior Therapy Techniques: An Introduction to the Treatment of Neuroses*. Oxford, Pergamon Press, 1968.
29. Lazarus AA. *Behavior Therapy and Beyond*. Northvale, J. Aronson, 1971.
30. Lazarus AA. *The Practice of Multimodal Therapy: Systematic, Comprehensive, and Effective Psychotherapy*. Baltimore, Johns Hopkins Press, 1989.
31. Marks IM. *Fears, Phobias, and Rituals: Panic, Anxiety, and Their Disorders*. New York, Oxford University Press, 1987.
32. Wilson GT, Grilo CM, Vitousek KM. *Psychological Treatment of Eating Disorders*. *American Psychologist* 2007;62:199-216.
33. Berkowitz R, Eberlein-Fries R, Kuipers L, Leff J. *Educating Relatives About Schizophrenia*. *Schizophrenia Bulletin* 1984;10:418-429.
34. Leff J, Warner J. *Social Inclusion of People with Mental Illness*. Cambridge, Cambridge University Press, 2006.
35. Miller WR, Rollnick S. *Motivational Interviewing: Preparing People for Change*. New York, Guilford Press, 2nd ed, 2002.
36. Hayes G. A history of psychoanalysis in South Africa, in van Ommen C, Painter D (eds). *Interiors: A History of Psychology in South Africa*. Pretoria, UNISA Press, 2008.
37. Sandler J. *From Safety to Superego: Selected papers of Joseph Sandler*. New York, Guilford Press, 1987.
38. Frankel FH. Hypnosis and related clinical behavior. *American Journal of Psychiatry* 1978;135:664-668.
39. Buhrmann MV. *Living in Two Worlds: Communication Between a White Healer and Her Black Counterparts*. Cape Town, Human & Rousseau, 1984.

40. Solms M. *Neurobiology and the neurological basis of dreaming*. In: Montagna P, Chokroverty S (eds), *Handbook of Clinical Neurology: Sleep Disorders*. New York, Elsevier; 2011.
41. Swartz L. *Culture and Mental Health: A Southern African View*. Oxford University Press, 1999.
42. Petersen I, Lund C, Stein DJ. *Optimizing mental health services in low-income and middle-income countries*. *Current Opinion in Psychiatry* 2011;24:318-323.
43. Sey Y. *Psychoanalysis and South Africa*. *Am Imago* 1998;55:3-8.
44. Stein DJ, Young JE. *Cognitive Science and Clinical Disorders*. San Diego, Academic Press, 1992.
45. Riso LP, du Toit PL, Stein DJ, Young JE. *Cognitive Schemas and Core Beliefs in Psychological Problems: A Scientist-Practitioner Guide*. New York, American Psychological Association, 2007.
46. Vaughan CL. *Imagining the Elephant: A Biography of Allan MacLeod Cormack*. London, Imperial College Press, 2008.
47. Papert S. *Mindstorms: Children, Computers, and Powerful Ideas*. Sussex, Harvester Press, 1980.
48. Lerer B, Sitaram N. *Clinical strategies for evaluating ECT mechanisms: pharmacological, biochemical and psychophysiological approaches*. *Progress in Neuro-Psychopharmacology and Biological Psychiatry* 1983;7:309-333.
49. Hayden MR. *Predictive testing for Huntington's disease: a universal model?* *The Lancet Neurology* 2003;2:141-142.
50. Robertson MM. *Tourette syndrome*. *Psychiatry* 2005;4: 92-97.
51. Markram H. *The Blue Brain Project*. *Nature Reviews Neuroscience* 2006;7:153-160.
52. Douglas RJ, Martin KAC. *Mapping the Matrix: The Ways of Neocortex*. *Neuron* 2007;56:226-238.
53. Berk M, Ng F, Dean O, Bush AI. *Glutathione: a novel treatment target in psychiatry*. *Trends in Pharmacological Sciences* 2008;29: 346-351.
54. Coplan JD, Abdallah CG, Tang CY, Mathew SJ, Martinez J, Hof PR, et al. *The role of early life stress in development of the anterior limb of the internal capsule in nonhuman primates*. *Neuroscience Letters* 2010;480:93-96.
55. Stein DJ, Daniels W, Emsley R, Harvey B, Blackburn J, Carey P, et al. *A brain-behaviour initiative for South Africa: the time is right*. *Metab Brain Dis* 2006;;21:279-84.
56. Stein DJ, Szabo C. *Psychiatry research in South Africa: Reason for cautious celebration?* *African Journal of Psychiatry* 2011;14: 86-87.
57. Manger PR. *Establishing order at the systems level in mammalian brain evolution*. *Brain Research Bulletin* 2005;66:282-289
58. Hemmings SMJ, Kinnear CJ, Van Der Merwe L, Lochner C, Corfield VA, Moolman-Smook JC, et al. *Investigating the role of the brain-derived neurotrophic factor (BDNF) val66met variant in obsessive-compulsive disorder (OCD)*. *World Journal of Biological Psychiatry* 2008;9:126-134.
59. Thornton HB, Nel D, Thornton D, van Honk J, Baker GA, Stein DJ. *The neuropsychiatry and neuropsychology of lipid proteinosis*. *Journal of Neuropsychiatry and Clinical Neurosciences* 2008;20:86-92.
60. De Waal F. *Tree of Origin: What Primate Behavior Can Tell Us about Human Social Evolution*. Cambridge, MA, Harvard University Press, 2001.
61. Kaminer D, Stein DJ, Mbanga I, Zungu-Dirwayi N. *The Truth and Reconciliation Commission in South Africa: relation to psychiatric status and forgiveness among survivors of human rights abuses*. *The British Journal Of Psychiatry*; 2001;178:373-377.
62. van Ommen C, Painter C (eds). *Interiors: A History of Psychology in South Africa*. Pretoria, UNISA Press, 2008.
63. Stein DJ. *Psychiatric aspects of the Truth and Reconciliation Commission in South Africa*. *The British Journal Of Psychiatry*; 1998;173:455-457.
64. Stein DJ, Seedat S. *From research methods to clinical practice in psychiatry: Challenges and opportunities in the developing world*. *International Review of Psychiatry* 2007;19:573-581.

**Open access to
African Journal
of Psychiatry
website**

www.ajop.co.za

**African
Journal of
Psychiatry**