

Evolutionary Psychiatry Special Interest Group (EPSIG)



Contacts

EDITOR: Dr Paul St John-Smith
(Consultant Psychiatrist)
paulstjohnsmith@hotmail.com

ASSISTANT EDITORS:
Dr Costa Savva, Core Trainee
Dr Sirous Golchinheydari, Core Trainee

EPSIG CHAIR: Dr Riadh Abed
(Consultant Psychiatrist)
abedrt@btinternet.com

FINANCE OFFICER: Dr Annie Swanepoel
(Consultant CAMHS Psychiatrist)
annie.panzer@gmail.com

EPSIG Website: www.epsig.org

EPSIG Youtube Channel:
www.youtube.com/@EPSIGUK/videos

Notes from the Editor

Welcome to the new team! Actually, we have always been collegiate and assisted each other but now Riadh Abed has taken over from me (Paul) to reprise his old role as chair and Annie Swanepoel has taken on the role of Finance officer. So, what is in store? Well, in this letter Riadh looks back on the first 8 years of EPSIG and there is an article on Daniel Dennett the most Darwinian of philosophers who sadly died recently. There is also an article on a recent event at the Royal College, which hosted in April Dr Iain McGilchrist for an afternoon of discussion about his scholarship on hemisphere differences.

Furthermore, we announce the details of this year's Charles Darwin essay prize. There are also some really interesting events this year culminating in the 6th Conference at the Royal college in November (Paul St John-Smith Ed.) We have an online AGM for EPSIG on the 6th September. All interested parties are welcome.

Charles Darwin RCPsych Evolutionary Psychiatry SIG

Do you want to be invited to speak at an international conference?

If you are a Psychiatry core or specialty trainee in the UK, you are eligible to apply and the two winners will be invited to speak for 10 minutes each at the EPSIG International Symposium on 22nd November 2024. Medical students, foundation doctors and staff grade doctors are also eligible to apply in their own categories with the prizes as below:

What you can win:

- a) Invitation to give a 10-min oral presentation at the EPSIG International conference held virtually on 22nd November for the psychiatry core and specialty trainee winners only.
- b) £100 pound prize money for the winner each of five categories (medical student, foundation doctor, core trainee, specialty trainee, staff-grade doctor)
- c) Certificate for the runner-up in each of the above five categories
- d) Winners and runners-up have their essay printed in the EPSIG Newsletter that is distributed to all EPSIG members (currently around 2700 psychiatrists and other professionals worldwide)

What you need to do:

Write a 1500 to 2000-word essay (excluding references) relevant to Evolutionary Psychiatry. The essay should be supported by a review of relevant literature and should be your own work.

The title is: "How an evolutionary perspective can improve our understanding of ... (pick any one psychiatric condition)".

You may want to visit the EPSIG YouTube channel at [Youtube.com/EPSIGUK](https://www.youtube.com/EPSIGUK), listen to the 'Evolving Psychiatry' podcast (on all major platforms), or read our published newsletters at [epsig.org](https://www.epsig.org) for inspiration and information.

Email your submission to sigs@rcpsych.ac.uk, with "Entry for EPSIG Essay prize" as title by 1st September 2024.

What we will do:

Entries will be judged by a panel of three EPSIG Executive Committee members. Criteria for judging will include: clarity of expression, understanding of the evolutionary literature and evidence, critical thinking and the overall ability to convey enthusiasm and originality. The committee reserves the right not to award the prize if no entry reaching the agreed minimum standard is received. Winners and highly commended other entrants will be informed by 15th October 2024.

Upcoming Evolutionary and EPSIG meetings

Evolutionary Psychiatry Pre-meeting, August 5-6, 2024 in Durham.

A pre-meeting on Evolutionary Psychiatry is planned for August 5-6, from late morning Monday until Tuesday noon immediately preceding ISEMPH 2024. All with an interest in how evolutionary medicine can help to advance the understanding, prevention and treatment of mental disorders are welcome. Members of the Evolutionary Psychiatry Special Interest Group in the Royal College of Psychiatry Evolutionary and members of the World Psychiatry Association Section on Evolutionary Psychiatry will join with ISEMPH members as active participants. The meeting organizers are Riadh Abed, Paul St John Smith, and Randolph Nesse. This will be a small meeting with plenty of breaks and meals to encourage lively discussion. Register early; there may not be room for all those interested.

Durham Instructions here. <https://isemph.org/Evolutionary-psychiatry-pre-meeting>

If you want to register only for the Evolutionary Psychiatry Pre-meeting, choose the "Evolutionary Psychiatry Pre-meeting ONLY registration option, and complete payment details later in the process. The fees cover the costs of the venue, breaks, two lunches, and a served dinner at The Cellar Door!. There are reduced rates for trainees!

Erice 2024

There is also a meeting in the fabulous village of Erice in Sicily. It is a most beautiful location and, from past experience, a wonderful setting. It is about ethology and mental health.

"BEYOND WORDS: ETHOLOGY OF NON-VERBAL INTERACTIONS IN THERAPEUTIC SETTING AND PSYCHIATRIC DISORDER", October 19-23, 2024. Erice, Sicily, ITALY. See link below.

Erice <https://centromajorana.it/nonverbalint2024/>



Upcoming Evolutionary and EPSIG meetings (cont.)

Ethology, as conceptualized in 1963 by Niko Tinbergen on the occasion of Konrad Lorenz's 60th birthday, deals with the function, mechanism, phylogenetic history, and adaptive value of physical traits as well as behaviour. Nonverbal signals conveyed by facial expressions, gestures, and body posture of Homo sapiens comprise a large part of communication that most likely exceed the information transmitted because most of nonverbal communication is outside conscious control. Thus, from an ethological and evolutionary perspective nonverbal behaviour is much more reliable in terms of the veracity and authenticity of the information that is transported to interacting conspecifics than verbal expressions. In other words, lying nonverbally is much more difficult than it is in verbal communication.

This aspect is of utmost importance in clinical therapeutic setting. The ethological methods and procedure to quantify nonverbal behaviour is the ethogram that provides catalogues of discrete elements of the behavioural repertoire of the species under study. Human ethograms have been used in a range of settings, including dyads of mothers and children, psychotherapeutic settings, and other clinical contexts that have greatly advanced our understanding of what kind of information and how it is conveyed beyond insight from subjective evaluations via questionnaires.

The purpose of the present workshop is to give an overview of the "state of the art" of the importance of the ethological approach for the understanding of nonverbal communication between human interactions in clinical therapeutic setting. Given our evolutionary history nonverbal behaviour will be explored in nonhuman primates and in animal- human interactions. This aim will be achieved by interdisciplinary discussion between ethologists, primatologists, child psychologists, psychiatrists, and psychotherapists.

RCPsych EPSIC Conference November 22nd 2024

Friday 22 November 2024 – 6th International EPSIG Symposium. More details to be announced soon.

The event information and booking link will be listed on the College's events page, [here](#).

FREE WPA EP Section web pages with links to all future webinars

<https://www.wpanet.org/evolutionary-psychiatry>

Registration is free of charge by clicking on the hyperlinks. All interested colleagues from all disciplines are welcome.

Royal Society of Medicine Conference – 9th June 2025—Evolutionary Conference

Special Article: EPSIG on its 8th Anniversary and Beyond

I have been closely associated with EPSIG since its inception, having been its proposer and founding chair and later its finance officer. Now that I'm due to start my second and final term as chair in just under 2 months, Paul (current chair), in his capacity as incoming newsletter editor, asked for my reflections on how things have progressed thus far and my view of the future of EP.

My interest in the application of evolutionary theory to the understanding of human psychology, mental health and mental disorder goes back several decades to the early 90's. During my 25-year career as a consultant adult psychiatrist in the NHS, I ran a psychosexual clinic for a decade or so and during that time I came across a book by Donald Symons titled 'The Evolution of Human Sexuality'. Symons is one of the early evolutionary psychologists who published this work in 1979 but I did not come across it until well over a decade later and reading it was a eureka moment for me. Suddenly, all the complex and disparate facts about human sexual dysfunction and human sexuality generally started to make sense. Looked at through an evolutionary lens, it became possible to organise a massive literature in a coherent and meaningful way that was simply impossible otherwise.

This raised a big question mark in mind. If such an important and relevant paradigm that offers such a depth of understanding was available, why was it absent from standard psychiatric and medical texts? In fact, even after the passage of several decades, I am still rather baffled by the disinterest and aloofness of mainstream psychiatry (and medicine generally) when it comes to the application of evolutionary principles and evolutionary thinking to the understanding of health and disease.

Most psychiatrists (and doctors generally) as well as medical students still have only very basic knowledge of evolution (if that) and most are either completely unaware (or have only a very dim

awareness) of the relevance of evolutionary theory to the understanding of mental health.

In the absence of any evolutionary peer group locally or nationally within the UK at the time, I continued to pursue my interest in EP as a largely solitary activity with occasional collaborations with trainees and others (none of which, unfortunately, led to long-lasting interest in EP) and this resulted in several publications including novel evolutionary theories on eating disorders, OCD and schizophrenia as well as a solo editorial in the *BJPsych* in 2000 advocating for the importance of evolutionary theory for psychiatry.

Things changed for me when, by chance, I met Paul at an RSM conference in 2013. The conference included a rare EP session and both Paul and I were eager to meet and chat with Randolph Nesse, the co-founder of the field of evolutionary medicine, who was a keynote speaker at this conference. Paul had been in a similar position to me, having an interest in evolution and being bereft of an EP peer group.

From 2013 onwards, Paul and I started corresponding by email and discussing ways of raising awareness of the importance of evolution among psychiatrists. So, when, by chance, an opportunity arose to apply to set up a new SIG at the college in 2014/15, I felt encouraged to make the case to the college. This process took almost a year and to our utter astonishment, we received far more support from members and fellows of the college than we ever expected, and we held the inaugural meeting of EPSIG in January 2016.

Since then, EPSIG has attracted a loyal core group of members who have been willing to contribute time and effort to the running of the SIG activities and this has included several trainees. Annie Swanepoel has played a particularly central role in EPSIG's progress, taking on the editorship of the newsletter and more recently the position of finance officer. She has also been most active in publishing multiple articles and chapters as well as

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speaking at various forums such as the RCPsych Congress, WPA conference on EP.

The EPSIG membership has continued to grow, and it currently stands at above 3000 which makes it the largest evolutionary psychiatry group anywhere in the world.

We have held 5 successful 1-day international symposia (the 6th is set to take place on 22 November 2024) and a similar number of half-day scientific meetings, both face to face and virtual and we have always made a financial surplus. So much so that EPSIG currently has the largest financial reserve of any college SIG.

In addition, we have held two 1-day Trainee Engagement workshops at the college, and these have been oversubscribed to the extent that we have had to place some applicants on a waiting list. We are delighted that trainees have a strong voice within EPSIG with 2 trainee members on our executive committee and also a parallel Trainee Executive Committee that meets and has active input both to the EPSIG executive committee as well as to the program of the Trainee Engagement workshop. Tom Carpenter has played a central coordinating role in trainee involvement. Other trainees who actively involved in EPSIG's work are Elena Titova-Chaudhry, Costa Savva and Sirous Golchinheydari.

In addition, EPSIG has published over 35 newsletters (the full set can be found on our college web pages). We are also the only college SIG with our own YouTube channel which has over 5000 subscribers and has been visited nearly half a million times!

Other achievements include editorials in the BJPsych Bulletin in 2016 and in the BJPsych itself in 2019 both advocating for the inclusion of evolution within the MRCPsych curriculum, and a further editorial accepted in the BJPsych due to be published shortly on the Evobiopsychosocial mod-

el. There have also been numerous evolutionary articles and chapters published by EPSIG members in a range of reputable journals and books.

In September 2022 an edited volume on evolutionary psychiatry was published jointly by the RCPsych and CUP with contributions from a number of EPSIG members which is the first time that the college had ever published an EP title. The volume has received good reviews and great endorsements. It has sold reasonably well around the world with a Turkish translation published at the end of 2023.

EPSIG has forged strong links with evolutionary colleagues in Ireland where speakers have reciprocally contributed to events held on both sides. Also, Irish trainees have a standing invitation to our Trainee Engagement workshops. We also have strong links with the WPA, EP Section, the International Society for Evolution, Medicine, and Public Health (ISEMPH) and, more recently, with the RSM, psychiatry section with whom we are planning a joint EP conference in 2025.

EPSIG have also, forged good links with Cambridge University through the co-option of Dr N. Chaudhary (evolutionary anthropologist) onto our executive committee and subsequently successfully bidding for IMPACT funding for meetings and a project on prenatal care.

Since 2019 EPSIG has run an essay competition every year or two where 2 Charles Darwin Prizes are awarded to trainees each worth £250, and the winners given a 10-minute presentation slot each at our international symposium.

EPSIG has been enormously fortunate and eternally indebted to the many eminent evolutionists around the world who have offered their moral and practical support to EPSIG. Many of them have spoken at our events, written chapters in the edited volume and offered encouragement in various ways. They include Randolph Nesse, Martin

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Brune, Alfonso Troisi, Robin Dunbar, Simon Baron-Cohen, Marco Del Giudice, Adam Hunt, Paul Gilbert, Henry O'Connell, George Ikkos, Daniel Nettle, and Derek Tracy (and numerous others!). We are also particularly indebted to Catriona Grant and the CALC team at the college for their forbearance and kind support of EPSIG.

However, it is particularly heart-warming to see the number of trainees who have come forward with interesting evolutionary ideas and who are enthusiastically supporting EPSIG activities in myriad ways, as they will be called upon to take

on the challenge of promoting evolution in psychiatry in future decades.

Running a SIG at the college can be time consuming and a heavy burden, but as the promotion of evolution is a passion of mine the effort is a labour of love and I'm looking forward to the next 4 years!

Riadh Abed, Chair elect

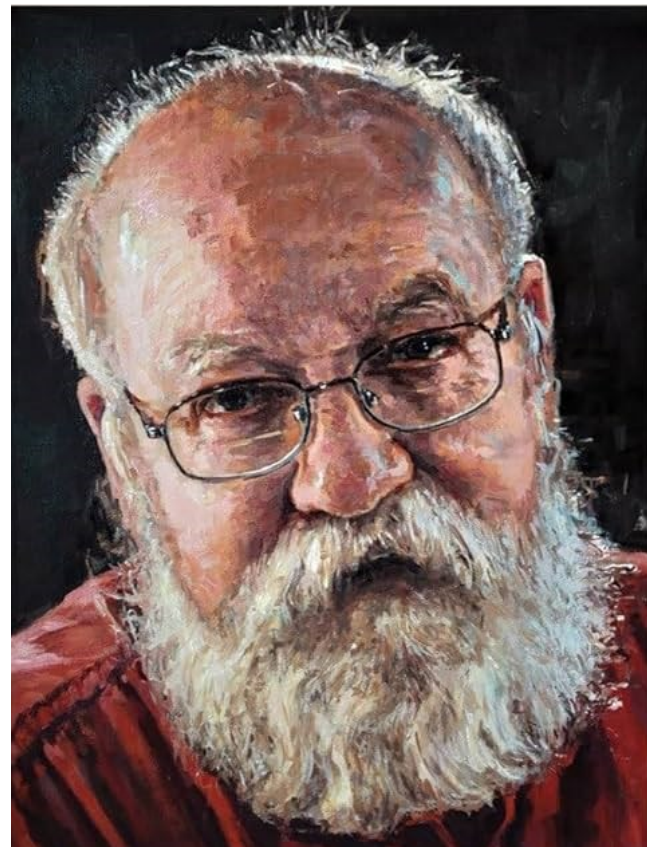
June 2024

In Memoriam: Daniel Dennett (1942-2024)

EPSIG mourns the death of Daniel Dennett. He died aged 82. Born in Boston, Massachusetts, Dennett was a scholar whose work extended across the boundaries of philosophy of mind, science, and biology. He was renowned for his contributions to the understanding of consciousness and his advocacy for a scientific view of the mind. A staunch supporter of evolutionary approaches, Dennett applied Darwinian ideas to a wide range of topics including human cognition and religiosity.

*Throughout his life, Dennett penned many influential books including *Consciousness Explained* and *Breaking the Spell: Religion as a Natural Phenomenon*, both leaving an indelible mark on contemporary thought – challenging and enlightening our understanding of the human condition.*

'Daniel's legacy is not merely in his scholarly contributions but also in his personable approach and his commitment to public understanding of science and philosophy. He was fun to spend time with a great thinker, but also humble. Our deepest condolences go to Daniel's family, friends, and the countless individuals he inspired. His death is a great loss to the evolutionary and humanist community and to the world of intellectual inquiry and he will be profoundly missed.'



EPSIG and PhilSIG host Dr Iain McGilchrist at the Royal College of Psychiatrists



About the authors

Dr Costa Savva, cos.savva1@gmail.com
Core Trainee, Southern Health NHS Trust

Dr Ben Griffin, ben.griffin001@gmail.com
South London and Maudsley NHS Foundation Trust; Department of Philosophy, King's College London.



Introduction

Dr Iain McGilchrist is a retired psychiatrist and author who was invited to discuss his academic work on the 5th April 2024 at the Royal College of Psychiatrists. The event was jointly hosted by the Evolutionary Psychiatry (EPSIG) and Philosophy (PhilSIG) Special Interest Groups of the College. Before we offer some insights into the character of the event, we will provide a brief overview of the key themes of McGilchrist's work. For a full review of his first major book, we would encourage readers to revisit Dr David Geaney's excellent article in Edition 4 of the EPSIG Newsletter (September 2016, www.epsig.org).

Synopsis

In his 2009 work *The Master and his Emissary*, McGilchrist seeks to approach the subject matter of hemispheric differences in a sophisticated manner, noting early on that this is a scientific area that has long suffered reductive and grossly oversimplified explorations. His fundamental argument rests on the idea that the right and left cerebral hemispheres must perform their different "functions" harmoniously, but that this balance is precarious and liable to disruption. Conventionally, the left hemisphere is viewed as "dominant", partly because it is the site of language. McGilchrist laments this over-valuation of the left hemisphere, arguing that this situation is directly antithetical to what is really the case; the rightful master is in fact the right hemisphere. But, like the ambitious emissary to a king, the left hemisphere is constantly tugging away from the primacy of the right hemisphere, over-confident and over-optimistic in its abilities, desperate to materialise its "take" on the external world.

McGilchrist proceeds to argue that important transition periods in the history of Western civilisation can be understood through the lens of hemispheric imbalance. Seen in this way, important cultural turning points reflect characteristic shifts in an ongoing "power-struggle" between left and right hemispheres. The result of these back-and-forth oscillations, occurring subtly over hundreds of years, is an ever-changing cultural landscape, whereby the prevailing cultural zeitgeist of the time is in large part dictated by the exact hemispheric balance. McGilchrist's libratory philosophy of history reaches its apotheosis in the here-and-now, where he presents a bleak vision of the West's future if it continues down its current path of untrammelled left-hemisphere dominance. In his 2021 work *The Matter with Things*, McGilchrist elaborates upon the psychiatric, epistemological, and ontological underpinnings of his decades-long scholarship in the field of hemispheric studies.

On the day, McGilchrist was in good form, presenting his work and answering questions with characteristic sophistication and eloquence for close to 7 hours during the afternoon sessions and dinner afterwards.



EPSIG and PhilSIG host Dr Iain McGilchrist at the Royal College of Psychiatrists

Session 1: Hemisphere theory and the implications for psychiatry

The first session was focused primarily on the psychiatric implications of his work; it's worth recapitulating some of the important differences in how the two brains experience the world.

The left hemisphere, having evolved for manipulation, employs language and abstract theorising to reconstruct a context-independent world in which it is not directly present. It is more interested in objects than relations; the explicit than implicit; the static than dynamic. Its impressive abilities for language, and its narrow attentional focus on the world, allows it to experience and re-present in mind a propositional knowledge of the world, one that is decontextualised, devitalised, and neatly categorised according to rules of logic. It views objects as parts or aggregates of parts, rather than irreducible wholes, and has little appreciation of the "flow" or "betweenness" of the world. In this pursuit, it is an effective emissary.

The real master, however, is the right hemisphere, that can see the bigger picture – a dynamic, flowing, contextualised world, rich in colour, texture, and life. This is the world of metaphor, of creativity, of connectedness to the world out there, of which we are more than just a "part of". In the

world of the right hemisphere, the contextualised particulars of existence, as opposed to abstracted universals and generalisations, matter more. It follows that, whilst the left hemisphere adheres to only base values of utility, the right hemisphere is animated by beauty, a sense of the sacred and of reciprocity, by love, poetry, and awe. For the right hemisphere, "being" in the world is a direct and reciprocal participation, whilst for the left hemisphere it can only ever be an impoverished, virtualised, and mechanical abstraction.

After briefly rehearsing this distinction, McGilchrist proceeded to outline the empirical research demonstrating hemispheric predominance in various neuropsychiatric conditions. In a particularly captivating segment, he referenced phenomenological research on schizophrenia by French psychiatrist Eugene Minkowski (1885-1972), who characterised the "vital loss of contact with reality" as the central "generative essence" of derangements in the underlying form of the psychopathology. Minkowski referred to a distinction between atrophy and hypertrophy of function, which McGilchrist noted correlates to the distinction between right hemispheric loss ("atrophy") and left hemispheric gain of function ("hypertrophy"), particularly manifest in schizophrenia (listed below in table).

ATROPHIED	HYPERTROPHIED
<i>life</i>	<i>map</i>
<i>instinct</i>	<i>brain</i>
<i>feeling</i>	<i>thought</i>
<i>'faculty of penetration which synthesises'</i>	<i>'analysis of infinite details'</i>
<i>trust in impressions</i>	<i>demand for proof</i>
<i>movement</i>	<i>immobility</i>
<i>events and persons</i>	<i>objects</i>
<i>presence</i>	<i>representation</i>
<i>goal</i>	<i>preliminaries</i>
<i>time</i>	<i>space</i>
<i>flow</i>	<i>measure</i>

EPSIG and PhilSIG host Dr Iain McGilchrist at the Royal College of Psychiatrists

Session 2: Philosophical implications on the humane practice of medicine

In the second half of the afternoon, McGilchrist went on to discuss the wider philosophical implications of his work, and how they pertain to the humane clinical practice of psychiatry. Although once again extraordinarily vast in its scope, his presentation may be summarised as an exceptional scientific mind emphatically cautioning against the overreach of an exclusively scientific world view. This entailed a fascinating discussion of epistemology and ontology. Epistemology is the branch of philosophy which investigates the nature and extent of human knowledge, whilst ontology concerns itself with understanding the nature of reality; what really exists. His ideas on both of these domains of philosophical enquiry followed clearly from his account of differential hemispheric function.

Although he was speaking clearly of the important value of scientific knowledge, McGilchrist sought to argue that there are at the same time profound limitations to this left-brain-dominant view of life; especially if it is mistakenly believed to constitute the only valid means of knowledge, given the left hemisphere's monopoly on language. Indeed, through the lens of an overconfident left-hemisphere, ideas such as value, purpose, and the sacred are destined only to be broken down, picked apart, and rejected as illusory. McGilchrist argued that we must recognise this left-hemisphere take as just one type of knowledge, which can only provide a partial account of what is. An epistemology that only allows as true that which can be expressed explicitly in language as a series of propositions, intolerant of ambiguity and contradiction, accordingly makes for a deeply impoverished view of life. For McGilchrist then, the often side-lined implicit and ineffable knowledge of the right-brain is of the most fundamental importance; our direct and intuitive senses of value, purpose, and the sacred are not illusions, but really do exist.

Correspondingly, he went on to talk about the great importance of psychiatrists expanding their knowledge and worldview beyond just the

limited view of human life that can be captured in its scientific representation. He spoke passionately about the beauty immanent in the natural world and art - particularly poetry and music - as portals to this kind of knowledge of the world, and argued that only through immersing themselves in this can psychiatrists begin to practise with the humanity required to heal their patients.

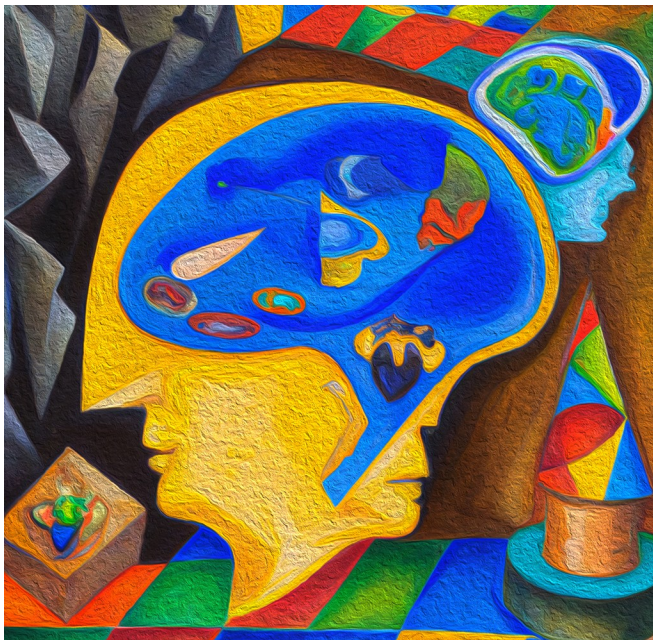
Some reflections from Ben Griffin

As evolutionary psychiatrists, there are some deeply challenging ideas bound up in McGilchrist's arguments. Such is our appreciation of, and enthusiasm for, evolutionary theory, that there's perhaps an ever-present tendency to wish to reduce all explanations of the human condition to evolutionary ones. McGilchrist would seemingly urge us to reject such tendencies. Thinking about things in evolutionary terms, whilst undoubtedly of great importance and utility, must always ultimately be in the service of the humane practice of psychiatry. It is of great interest to me to note that there seems to be a deep resonance between this line of thinking and Darwin's reflections on his life's work, meditated upon in a short autobiography only intended for close family, written in the twilight years of his life.

"I have said that in one respect my mind has changed during the last twenty or thirty years. Up to the age of thirty, or beyond it, poetry of many kinds, such as the works of Milton, Gray, Byron, Wordsworth, Coleridge, and Shelley, gave me great pleasure, and even as a schoolboy I took intense delight in Shakespeare, especially in the historical plays. I have also said that formerly pictures gave me considerable, and music very great, delight. But now for many years I cannot endure to read a line of poetry: I have tried lately to read Shakespeare, and found it so intolerably dull that it nauseated me. I have also almost lost my taste for pictures or music. Music generally sets me thinking too energetically on what I have been at work on, instead of giving me pleasure. I retain some taste for fine scenery, but it does not cause me the exquisite delight which it formerly did... This curious and lamentable loss of the higher aesthetic tastes is all the odder, as books on history, biographies, and travels (independently of any scientific facts which they may contain), and essays on all sorts of subjects interest

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me as much as ever they did. My mind seems to have become a kind of machine for grinding general laws out of large collections of facts... if I had to live my life again, I would have made a rule to read some poetry and listen to some music at least once every week; for perhaps the parts of my brain now atrophied would thus have been kept active through use. The loss of these tastes is a loss of happiness, and may possibly be injurious to the intellect, and more probably to the moral character, by enfeebling the emotional part of our nature."



Some reflections from Costa Savva

McGilchrist's work is a veritable tour de force, with profound implications for the nature of the longstanding divide in philosophy between continental and analytic thinking, and in particular how these fields approach the mind. The former, with Husserl's phenomenology as an exemplar, seeks to build up a knowledge of the world by starting from the inside of a subject and looking out, utilising in its methodology a rich and diverse vocabulary and grammar. Heavily reliant on metaphor, phenomenology has no other option available to it given the limitations of language in describing internal mental experience; its subject matter is ineffable.

Contrast this to the traditional epistemology of the scientific method, which privileges increasingly accurate mathematical modelling of the "external" physical and biological worlds. Here, language is used precisely, to describe repeatable and objective phenomena that accord to some sort of clear causality in their interactions. When it comes to scientific conceptions of the mind, the modern day empirical enterprises of neurobiology and psychology adopt an "outwards-in" approach, in stark contrast to the "inwards-out" methodology of phenomenology.

What's interesting, however, is that it can be argued these two "takes" on the human mind very closely resemble what McGilchrist asserts the hemispheres are doing. Their different takes may be at core summarised by either a predominant focus on *objects* (left; Man as decontextualised-object-like-any-other) or on the *relations between them* (right; Man as subject-in-context or being-in-the-world). Perhaps the lesson here is that to truly understand the world around us, and our own minds central in creating it, we must attempt to bridge both takes, both epistemologies, and strive towards a "neurophenomenological" approach that allows the master and his emissary to exist within perfect symbiosis. This means that, if we are to truly understand the mind, and by implication the abnormal mental processes that cause untold suffering to our patients, we must bridge the arbitrary subject-object divide and embrace explanatory pluralism. Finally, this enterprise must explicitly be subsumed within an evolutionary framework, for nothing in biology makes sense except in the light of evolution.

