



## **A Discourse on Hypergraphia and Other Writing Pathologies, Not Omitting Left-Handedness and Mirror Writing.**

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# A Discourse on Hypergraphia and Other Writing Pathologies, Not Omitting Left-Handedness and Mirror Writing

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## Abstract

Writing, a highly specialised motor activity integrally linked to language, is an intrinsic activity of our species and has played a huge part in the progression of civilisation. Being unable to read and write in today's world is a huge liability. In this review, we look at issues related to writing including handedness, agraphia, hypergraphia, mirror writing, the role of pathology, psychiatric illness and artistic talent. Case studies include the prophet Ezekiel, Arthur Inman, Leonardo da Vinci and Vincent van Gogh. The study of writing is important and deserves further attention.

**Keywords:** Writing; Handedness; Hypergraphia; Ezekiel; Leonardo da Vinci; Vincent van Gogh; Arthur Inman; Pablo Picasso.



*'Another d-mn'd thick, square book! Always, scribble, scribble, scribble! Eh! Mr. Gibbon?'*

King George 111 on receiving a copy of the first volume of Edward Gibbon's great work.

*'If the skin were parchment and the blows you gave were ink, Your own handwriting would tell you what I think'.*

William Shakespeare

*'Writing in English is the most ingenious torture ever devised for sins committed in previous lives'.*

James Joyce

## Introduction

Writing, a highly specialised motor activity integrally linked to language, is an intrinsic activity of our species and has played a huge part in the progression of civilisation. Being unable to read and write in today's world is a huge liability for any individual. For those of us with the ability to write changes can occur of reduced or absent writing and the opposite state, hypergraphia.

Before looking at those issues we must consider the issue of handedness – nothing in the study of writing leads to as much mythology, confusion and dispute. Handedness is an individual's preferential use of one hand, known as the dominant hand, due to and causing it to be stronger, faster or more dextrous. The other hand, representing the inherent bias, is often called the non-dominant hand.

Handedness arises from the laterality of the brain and involves other issues besides writing. Contradicting the theory that left handers have their speech centres in the right brain, this only occurs in 30% of cases.

The book of Judges tells us that the first left-hander known in history is the biblical character Ehud, son of Gera (circa 1200 BC) who assassinated Eglon, the king of Moab, by a sword held in his left hand. Many examples follow after that. Christopher McManus, the great authority on laterality, describes the cultural war to list great artists like Picasso and van Gogh as left-handed despite overwhelming evidence that they were dextral. To compensate the sinistral groupies there can be no better



example of the talent derived from being a leftie than the ultimate Beatle, Sir Paul McCartney.

There are also many examples of left-handedness in art. An especially intriguing example is the first masterpiece by van Gogh, The Potato Eaters where the five peasants sitting around the table are all left-handed, possibly unique in great painting. However, this was not intentional but due to inadvertent reversal printing of the lithograph.

Schizophrenia, bipolar disorder, anxiety disorders, dyslexia, alcoholism and autism have been associated with left- and mixed-handedness. The basis for this is the lack of full lateralisation of the brain to varying degrees. Again, the statistics and methodology should be questioned and it is risky to accept this as an established fact.

Left-handedness, historically, has had a bad press and many were those forced at school to change to dexterity, even accused of witchcraft in the past. The counter-mythology is that the sinistral folk are more talented, viz Leonardo, and better at some physical activities, such as tennis. There is also the claim that paraphiliacs and homosexuals are more likely to be left-handed but, again, this is highly disputed, the statistics are difficult to confirm and is best left as an open issue.

The agreed facts are that true left-handedness is found in 8-12% of the population, there is a strong family link but the genetics do not always run true. Add to that women, as a group, are more strongly right-handed meaning that they are more strongly lateralised and explains why they have better verbal skills.

True ambidexterity, the ability to use both hands, is relatively rare. Famous examples include Albert Einstein, Benjamin Franklin, Nikola Tesla, James A. Garfield and Leonardo da Vinci. Even more uncommon is the ability to use both hands simultaneously for different tasks, thought to arise from a split in the corpus callosum (the 'split-brain'). An interesting literary example is Branwell Brontë, the dissolute epileptic brother of the famous literary sisters.

Brain disease can impair the ability to write (dysgraphia), sometimes extending to complete loss of the ability (agraphia). A bizarre variant is alexia without agraphia



where patients can write perfectly but are incapable of reading what they had written.

Less well-recognised and frequently overlooked (as well as more interesting) is an increase in writing activity. Hypergraphia is the excessive production of writing or drawing. It represents a range of behaviours that exceed cultural norms and personal habits. Furthermore, that excessive writing and drawing is an innate ability of some highly talented artists tells us something about their creativity.

Automatic writing is a form of hypergraphia in patients with diffuse neurological damage such as cerebral strokes, brain tumours, multiple sclerosis, and frontal lobe dementia. These patients will often write about their immediate surroundings. The writing is mechanical and holds no personal significance. Some of these patients will begin writing as soon as they are given a pen and paper and continue until the writing materials are forcibly removed. The script is untidy and riddled with spelling, punctuation, and grammar errors. This is considered to be a form of utilisation behaviour with the inhibitory function of the frontal lobes suppressed, thus leaving the subject dependent on the slightest stimulus. In most cases automatic writing is transient, usually lasting only a few weeks.

Hypergraphia can occur in patients with temporal lobe epilepsy (TLE), fronto-temporal dementia, stimulant drug addiction and Asperger's syndrome. 73% of cases of hypergraphia have TLE. The Geschwind Syndrome<sup>1</sup> is a group of behaviours including compulsive writing in people with TLE. Such patients have hyperreligiosity, hyposexuality, circumstantiality and an 'intensified mental life' as an interictal phenomenon. Their hypergraphia is characteristic of the phenomenon. Norman Geschwind described it as the intellectual expression of heightened emotional affect arising from an overcharged temporo-limbic system.

These individuals are preoccupied with the cosmic and supernatural and feel they are on a messianic mission to save the world. Their conversation is pedantic and full of circumlocutions, which results in communication difficulties and problems in concluding conversations. A characteristic "stickiness" of thought also makes it hard for them to let go of a topic of interest. Some get into difficulties with the law because of aggressive outbursts or sexually deviant behaviour.

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<sup>1</sup> Also called the Gastaut-Geschwind Syndrome.



They have a drive to record facts and memories through writing in as precise and objective a way as possible. Their script is highly stylised, meticulous, and elaborate, and its content sometimes has moral and religious overtones. Ear worms and ciphers are also sometimes incorporated into the text. The use of capital letters and underlining for emphasis may be striking, and there are sometimes exuberant annotations filling the margins. Mirror writing, neologisms and coloured inks are sometimes used. Despite its compulsive quality the writing provides little relief or pleasure.

Another type of hypergraphia, on the same basis as excessive gambling, can occur in people taking L-DOPA medication for Parkinson's disease.

In the past automatic writing in which a person in a trance produces a coherent but involuntary narrative in a script entirely different from their own was sometimes employed for clairvoyance by mediums but must be considered rather dubious.

Hypergraphia is not just a neurological symptom but can occur in psychiatric disorders as a written manifestation of thought disorder in bipolar disorder and schizophrenia. Schizophrenic writing can sometimes be recognised by its dysfluency, the presence of interlarded neologisms, clang associations and word salads and the greater use of third person plural pronouns and fewer first person pronouns. The great Kraepelin gave a classical description of the phenomenon that is still worth reading. The splendid word Graphorrhea is a term used to describe the long and sometimes grandiose lists written by people with acute mania.

In forensic psychiatry the writing of vexatious litigants, at least some of whom have a degree of paranoia, can have all the twirls, whirls, marginalisation and excesses of other forms of hypergraphia.

## Cases of Hypergraphia

The prophet Ezekiel had the Geschwind syndrome and this is evident in his Book of Ezekiel, the fourth longest book in the Old Testament—more than fifty per cent longer than Leviticus—and only three per cent shorter than Genesis, which covers a vastly greater timespan in history.

Ezekiel's hypergraphia and stickiness are evident in many lines, for example:



Then came the word of the Lord unto me, saying 'Son of man, speak unto the elders of Israel, and say unto them, 'Thus saith the Lord God; Are ye come to inquire of me? As I live, saith the Lord God, I will not be enquired of by you.' [...] And say unto them, Thus saith the Lord God [...]

This is a graphic example of Ezekiel's inability to let go of anything once he has seized on it, almost crippling his ability to conclude the paragraph. Ezekiel's religiosity is by any standards extreme, even when compared to other prophets. Yet, Ezekiel was able to write chapters of intensely lyrical prose or poetry—literature of the highest order.

Lewis Carroll, the author of *Alice in Wonderland*, is said to have had hypergraphia, having written more than 98,000 letters in different formats, backwards and in curlique patterns. Some were written in rebus and in patterns, as with "The Mouse's Tale" in *Alice*.

The great Russian author Fyodor Dostoevski, who had TLE, wrote frenziedly between seizures, driven by the periods of ecstatic or religious aura in which the world around him was flooded with meaning from his seizures. The TLE also drove his gambling binges.

Amphetamine addicts with hypergraphia can display punding, a repetitive stereotyped behaviour due increased dopamine release in the ventral striatum and limbic system. Famously, Jack Kerouac, fuelled by caffeine, nicotine, and Benzedrine, wrote *On the Road* on a continuous 120 feet roll of paper in three weeks. The text had no paragraphs or margins.

Robert Louis Stevenson's *The Strange Case of Dr Jekyll and Mr Hyde* was produced during a six-day, 6000-word cocaine spree. This is indicative of the production of dopamine by drugs like cocaine and amphetamine.

Recent authors who claimed to be hypergraphic include Isaac Asimov and Eleanor Alice Burford (it tells you something that her pen-names included Jean Plaidy, Victoria Holt, Philippa Carr, Eleanor Burford, Elbur Ford, Kathleen Kellow, Anna Percival, and Ellalice Tate). Scottish writer Naomi Mitchison wrote over 90 books of historical and science fiction, travel writing and autobiography.

A case of hypergraphia with forensic significance was Virginia Ridley who remained secluded in her home for twenty-seven years in Ringgold, Georgia, in the United



States. When she died in bed of suffocation in 1997, her husband Alvin Ridley was charged with her imprisonment and murder. At the trial, her journal of ten thousand pages was submitted as evidence, showing that she had epilepsy and had remained housebound of her own will. It is likely she died as a result of a seizure and the hypergraphia indicated that she had TLE. The written evidence, from beyond the grave, resulted in her husband's acquittal.

What is believed to be the longest (and deservedly obscure) novel in existence, *The Story of the Vivian Girls*, was written by the forgotten Henry Darger.

American Alan Hovhaness always carried paper and pen on him and would compose in shopping malls, restaurants and buses. While he was young, he threw over 1000 of his compositions into the fireplace and at the time of his death in 2000, had penned around 500, most of which are published.

Between 1977 and 2003 US Senator Bob Graham kept meticulous records of his daily life, filling almost 4000 notebooks with such trivia as his weight, clothes, what and where he ate, the movie he watched, strangers he'd met at airports and matters of state. Each notebook, colour-coded by season, covered two to three days. Graham maintained his notebooks were an efficient management system: 'I would rather have more detail than less'. This resulted in Vice President Al Gore dropping him as a running mate.

The hypochondriacal wealthy American recluse and (rightly) unsuccessful poet Arthur Inman would pay people to "talk" to him so that he record of their stories. From 1919 until he committed suicide in 1963, he wrote his 155-volume diary which contained over 17 million words, making it one of the longest recorded diaries in the English language. An obsessive recluse, he was committed to having his diaries published to establish his immortality and this was eventually done in a redacted version of five lengthy volumes.

Inman had hypergraphia, pedantry, socially inappropriate behaviour, mental stickiness, obsessiveness, extreme views and reduced sexual drive associated with perverse outlets. These features are more than sufficient to confirm that he had the Geschwind syndrome. David Bear and Libby Smith ran the Bear-Fedio questionnaire (a diagnostic test for the Geschwind syndrome) on Inman. Inman got high marks for nearly all of the eighteen traits listed on the questionnaire. 'Compulsive attention to detail' described Inman's need to make lists and keep rigid



schedules. His child-like behaviour and tendency to fly into rages translated into high scores in several categories: 'dependence', 'deepening of all emotions', 'humourlessness' and 'paranoia'. And his effort to chronicle his era demonstrated his grandiosity and sense of personal destiny. Their assumption was that this could only have been caused by TLE.

Putting all of these writers in the shade was The Reverend Robert Shields who maintained a diary chronicling every five minutes of his life from 1972 until a stroke in 1997. The gigantic work filled eighty-one boxes and contained approximately thirty-eight million words, raising the question of how many trees had to be sacrificed to meet his writing needs.

Hypergraphia can also manifest with prolific drawing, to an extent that cannot be considered within the normal range. This raises the question whether some artists with an extraordinary prolific output fall into this category. A good example would be Pablo Picasso who started drawing at the age of three and continued without respite until his death at the age of 91, producing an estimated 50,000 works of art, including paintings, drawings, sculptures, ceramics, and prints. There is no evidence that he had any psychiatric disorder and most accept that his output was simply the result of his prolific creativity.

Another example would be the Australian painter Sidney Nolan who created thousands of works, including paintings, drawings and stage designs. His mural *Snake*, 9.14 meters high and 45.72 meters wide, at *MOMA in Tasmania* consists of 1620 individual panels that together form the image of a giant serpent.

Nevertheless, in understanding the work of such painters, rather than pathologize them, it must be asked whether a hypergraphic tendency was not a significant drive in creating their output which their innate talent turned into significant art works.

In studying hypergraphia in artists, there can be no better subject than the ultimate Renaissance figure, Leonardo da Vinci who's writing also displays some other interesting forms. No one will doubt his extraordinary prolific output. For Leonardo, painting was 'the sole means of reproducing all the known works of nature'. He always thought of himself as an artist and continued to paint until his hand became paralysed late in life. The surviving diaries, notebook and drawings are just a small indication of the wide range of his activities. He can truly be considered to be the most curious man in history.



Leonardo was also the most famous left-hander in history.<sup>2</sup> His drawings were carried out with the left hand, the shading or hatching typically sloping downwards from left to right, that is \\\, rather than in the more typical direction seen in drawings carried out by right-handers using their right hand, where the hatching slopes down from right to left, that is ///.

From Popham we learn that ‘there appears to be no instance of a genuine drawing which can be shown to have been drawn by Leonardo with his right hand’. Almost every drawing attributed to Leonardo that is shaded from right to left is either unlike him in other respects or is demonstrably a copy.

But his script was not just left-handed. All of Leonardo’s writing, including his signature, was done in mirror writing. In this form of writing, a person writes in the reverse direction to normal, with each letter reversed. Leonardo used mirror writing throughout his life; the first dated note by Leonardo, written at twenty-one, is done in mirror writing. It was naturally written from right to left with margins on the right hand side of the page; that is, if read normally, it appears back to front, and can only be understood by being reversed when viewed in a mirror.

Vasari noted how Leonardo ‘wrote notes in curious characters, using his left hand, and writing from right to left, so that it cannot be read without practice, and only at a mirror’. Pacioli described how ‘he wrote in the reverse direction and left-handed, so that it could only be read when held to a mirror, or by looking at the paper from the reverse, against the light [...]’

One of Leonardo’s drawings is of a left hand holding a pen or quill, the posture in which the pen is held in the drawing is in the conventional posture employed by the majority of left-handers and nearly all right-handers. This drawing is interpreted as portraying Leonardo’s own hand.

Mirror writing was first described in 1688, but Buchwald listed it as a pathological phenomenon in 1878. A hundred years ago Allen made these observations: mirror writing is often a symptom of nerve disease; but the disease need not be the cause of the existence of the faculty, but only the cause of its discovery.

Mirror movements, symmetrical movements of the opposite side, occur in

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<sup>2</sup> Chris McManus believes that Leonardo was brought up and learned to write with the right hand but an injury meant that he used his left hand for drawing and mirror writing. This remains to be proved.



childhood, before there could be a conscious attempt to restrict this. When the right hand is used for writing, there will be a natural tendency for the left hand to perform these writing movements in mirror-fashion due to activation of muscles on that side. In most cases, mirror writing arises as a variant of the circumstances in which left-handedness emerges.

Mirror writing is almost always found in left-handers, and both left-handedness and mirror writing are more common in the intellectually handicapped because they have difficulty in converting innate mirror writing to script which can be read. Dyslexic children (who are more frequently male) not only have poorly established cerebral dominance, but word reversals and mirror writing of letters. It can also occur in normal children who are learning to write (either hand), people with congenital word blindness and left-handed individuals who have been taught to write with their right hand bi-manual writing (writing with both hands), forehead writing, writing on the under surface of a board, altered states of consciousness following a blow to the head, during hypnosis, in hysterical trance states, alcohol and drug intoxication, tremor and due to Parkinson's disease, spino-cerebellar degeneration and mental abstraction; for example, telegraphists were known to jot down messages with their left hand in mirror-fashion, whilst their right hand was held on the key. Lewis Carroll, among his many lexigraphic quirks, also used mirror-writing in letters in children who corresponded with him.

Abduction (away) or centrifugal (outward) movements are the most natural for both hands; if you go to the blackboard with a piece of chalk, you naturally draw a line from left to right when the chalk is held in the right hand. If the chalk is held in the left hand, the line will instinctively be drawn from right to left. Similarly, a circle drawn with the right hand is executed in a clockwise direction, if drawn with the left hand in an anticlockwise direction.

Why do all left-handers not write in mirror writing? This can be attributed to the powerful influence of education and Western culture in which left-to-right writing prevails. To this can be added the stigma of left-handedness, let alone that of mirror writing, until recent times. After an initial period of competition between conventional and mirror writing (and mirror writing is occasionally observed in most young children), the left-handed mirror-writing tendency will be replaced by conventional writing.

Why did Leonardo's writing not change during childhood to right-handed and



conventional script? He had little education at the formative stage of his writing and pressure to do conventional writing would be less likely to have been applied. Also, his confidence and intellect would have already been sufficient to withstand pressure to conform. Finally, as much of his work was not intended for public display, there was little necessity for him to be able to express himself in an easily understood fashion.

The notebooks reveal both mirror and conventional numbers. Leonardo would have learned his arithmetic at school when mirror numbers may have attracted criticism from his teacher, at a time of acquisition of new skills and when automatic movement may have been under greater voluntary control. This would explain why his numbers are often written in conventional form.

When a person writes in the conventional, non-inverted manner, the brain's language centre is opposite the dominant hand. In other words, that Leonardo was a left-hander since childhood, who held his pen in the conventional posture, favours the view that his language skills were situated in the right hemisphere, which is unusual for the majority of people.

Leonardo did not have any disorder or pathology of his brain until the stroke shortly before his death. It seems clear that he had a dominant right hemisphere localisation for speech and language skills. This brings us to the thesis that the degree of lateralisation of the brain is what determines the human capacity to express itself, in the process rendering some individuals susceptible to different problems and pathologies, but mostly providing for our superb and unique individuality.

Dyslexia, immune disorders and left-handedness are thought to share a common factor: elevated levels of prenatal testosterone. Creativity is frequently reported to be linked with left-handedness, more specifically in men. The proportion of left-handers also appears to be greater in gifted children.

After Leonardo we have Vincent van Gogh, frequently described as the definitive case of excessive drawing and painting. His production of paintings surpasses that of major Renaissance and Baroque artists who had teams of students and assistants included in their projects. His explosion of creativity in Arles (1888 to 1889) generated 200 paintings, 200 drawings and watercolours – a new work every 36 hours.



Aside from his output of paintings, his letters are the most superb example of the thoughts and work of a painter. Every night after painting for 14 to 16 hours, he would write to his brother Theo. The volume and output, let alone the detail, is astonishing, the shortest letter six pages. Written in a neat script, they fill the pages, often overflowing on the margins, with inserted comments and added pictures. The paragraph below is an example. Note the overwriting and repetition of the word idler:

There is a great difference between one idler and another idler. There is someone who is an idler out of laziness and lack of character, owing to the baseness of his nature. If you like, you may take me for one of those. Then there is the other kind of idler, the idler despite himself, who is inwardly consumed by a great longing for action who does nothing because his hands are tied, because he is, so to speak, imprisoned somewhere, because he lacks what he needs to be productive, because disastrous circumstances have brought him forcibly to this end. Such a one does not always know what he can do, but he nevertheless instinctively feels, I am good for something! My existence is not without reason! I know that I could be a quite a different person! How can I be of use, how can I be of service? There is something inside me, but what can it be? He is quite another idler. If you like you may take me for one of those.

In addition to hypergraphia, van Gogh had all the features of the Geschwind Syndrome. He had an unconventional sexuality, alternating between periods of hyposexuality and hypersexuality, liaisons with women and men including, it is now thought, Paul Gauguin. There are many examples of social clinging, inability to understand social boundaries, insensitivity to the feelings of others, tendency to moralise, criticize and make impossible demands, pedantry and obsessiveness, his intense religiosity, tendency to derive spiritual meaning from his paintings, and viscosity of thinking.

The stormy relationship with Gauguin illustrated not only his mental stickiness but also his aggression. Gauguin bemoaned the difficulty of ending conversations with van Gogh. The affair culminated in the painter's famous auricular self-amputation: during a heated argument, a voice in his ear whispered, "Kill him," so he attacked Gauguin with a razor; then he turned the blade against his own ear and went to a brothel to present the severed earlobe to a favoured prostitute.

Van Gogh had Geschwind Syndrome – but what of the cause? Norman Geschwind, no less, said it was epilepsy, just like Dostoyevski. But was he right? Van Gogh had several seizures and was diagnosed with epilepsy during his lifetime. This led a



number of writers – notably Dietrich Blumer – to diagnose TLE. Ronald claimed that the painting Over the Ravine shows signs of a seizure during composition: brush strokes actually tore the canvas.

Shahram Khoshbin believes that tertiary colours consistently appear in the artwork of those diagnosed with epilepsy, describing van Gogh's Self-Portrait in the Fog as an outstanding example. Khoshbin studied van Gogh's work to determine the link between his use of colour and emotion, noting that van Gogh would pair certain colours—such as blue-violet with yellow-orange—to evoke emotions. As he said in his letters:

It often seems to me that night is still more richly collared than the day, having hues of the most intense violets, blues, and greens. If only you pay attention to it you will see that certain stars are citron-yellow, others have a pink glow, or a green-blue and forget-me-not brilliance.

As mentioned, the many other causes cited for van Gogh's illness are either wildly speculative and untenable, or merely symptomatic, rather than the primary diagnosis. John Hughes reviewed the evidence and was unable to confirm the presence of TLE. In those days, the diagnosis of epilepsy was applied to any seizure, if not a range of other symptoms. The only mention of ictal (seizure) activity is late in van Gogh's life when he had withdrawal seizures from alcohol and thujone, the toxic ingredient of absinthe. These are, in other words, secondary seizures, not indicative of a primary epileptic disorder.

Therefore, in Hughes' words, van Gogh's Geschwind Syndrome was an “orphan in search of a parent”. What that was will remain unknown. What we can say with some confidence is that the overcharged output from van Gogh's temporo-limbic brain was the driving force in a life that, if any one can be said to be, was emotion incarnate. Tormented, tortured, maddening, impossible, often messianic, at times deluded, van Gogh's life oscillated from the heights of elation to the depths of despair but he never gave up until he was overwhelmed by his inner demons, leaving us a legacy of the graphic illustration of human feelings that will never be surpassed. But this is something he was never be able to know.

Well, right now it seems that things are going very badly for me, have been doing so for some considerable time, and may continue to do so well into the future. But it is possible that everything will get better after it has all seemed to go wrong. I am not counting on it, it may never happen, but if there should be a change for the better I should regard that as a gain, I should rejoice, I



should say, at last! So there was something after all!

## Conclusion

Writing, our most important means of non-verbal communication, is profoundly important. The rise of computers, smart phones and keyboards may diminish the role of handwriting but still express the concepts intended by the author. Writing can occur in different iterations and assume pathological forms like agraphia or hypergraphia. The latter can occur spontaneously or from organic disorders like TLE and is an important feature of the work of some talented writers and artists. The study of writing is an intriguing exercise that can be very revealing and more attention ought to be paid to it.



## References

The writings of Chris McManus, Norman Geschwind, Marian Annett and Timothy Crow were consulted for this article. Ezekiel, Arthur Inman, Leonardo and Vincent van Gogh were chapters in my book *The Exceptional Brain and How it Changed the World*. Allen & Unwin, 2011.



## About the Author



**Professor Robert M Kaplan** is a Clinical Associate, forensic psychiatrist, writer and historian at Western Sydney University. He writes on the history of psychiatry, current problems in medicine, crime and medical murders.