Joe Griffin *and* ***Ivan Tyrrell*** *show how caetextia can account for both psychosis and autistic spectrum disorder (ASD) – and is supported by exciting new brain research.*

ASD and psychosis: is caetextia the link?

A SEVERELY autistic child sits, expressionless, on the floor, oblivious of those around him, repeatedly spinning the wheel of a toy truck, his gaze fixed. He pays no attention when his name is called or when his mother tries to take him by the hand. A young woman in the grip of psychosis walks fearfully down a street, convinced that everyone is looking at her with ill intent and can read her thoughts. It may seem that these two states have nothing in common but we suggest that they are the reverse of the same coin and have the same root.

This is not as unlikely as it may sound. For instance, whereas those with ASD are preoccupied to an extreme degree with objects and systems and have little sense of 'self', those with psychosis are preoccupied with relationships and over-sensitive to the responses of others to the point of delusion. The behaviours are seemingly at opposite ends of a spectrum.

Another indication of a connection is the long-established, seemingly puzzling, link between creative genius and mental illness, and creative genius and Asperger's syndrome, at the high end of autistic spectrum disorder. Even if someone who is a genius is not directly affected by psychosis, often there is history of mental illness within the family. Yet it is equally clear from the extensive writings of Irish psychologist Michael Fitzgerald on the relationship between creativity and autism that civilisation wouldn't have existed without people who had an element of Asperger's.[1] Those who had it include Einstein, Newton, Darwin, philosophers such as Wittgenstein and Bertrand Russell, and literary giants such as Joyce and Yeats. In the general population, schizophrenia and autism are not correlated, in that families in which there is schizophrenia are no more likely than any other family to have members with autism and vice versa. However, where there is true creative genius, both conditions are commonly found in the family. For instance, James Joyce had a daughter with schizophrenia and Bertrand Russell had two children with schizophrenia.

It may seem contradictory that the genes predisposing to both psychosis and Asperger's can also contribute to genius, when the former is all about imagination and the latter about obsession with concrete reality. In fact, we maintain, there is no contradiction. It is clear that we need a strong imagination for creativity but we also have to be obsessively focused in order to solve the problem, complete the symphony or whatever it is that we have set out to do. So elements of both are needed for true genius. However, it is hard for nature to keep a precise balance and so the stronger imagination, if undisciplined, may result in a higher risk of psychosis, and an obsessive focus may result in autistic traits. But some elements of both, we hold, are necessary just for effective functioning, too, let alone genius. Social anthropologist Christopher Badcock takes a similar view, eloquently arguing in his book *The Imprinted Brain* (reviewed on page 44) that the genes that can, if out of kilter, create the conditions for psychosis, and those that can, if out of kilter, create the conditions for ASD, are the very genes that enable civilisation to survive: "One gave us our society, culture, language and ability to empathise and interact with other people's minds. The other gave us science, technology and all the manual, mechanical and technical skills on which our civilisations depends."[2]

If autism and psychosis seem to be reverse sides of the same coin, there must be an underlying mechanism that explains the development of one or the other. We have long maintained that this is the REM state, the brain state entered during dreaming and also during daydreaming. Theories we have put forward to explain autism, Asperger's syndrome and psychosis all centrally involve the REM state. Now, emerging scientific evidence is starting to show how they might all link together.

Water baby theory

In 1999, one of us (Joe Griffin) put forward the 'water baby' theory to explain the strange ritualistic behaviours associated with autism, which no other theory has yet accounted for.[3] The theory posits that autism results from a particular infant's failure to develop the mammalian responses that normally orient us to our environment and form the basis for future learning. When our evolutionary ancestors first started to make the huge shift from being aquatic creatures to becoming land creatures, the 'mammalian' brain began to develop on top of the existing 'amphibian/reptilian' brain. It is in the part of the mammalian brain known as the limbic system that the emotions, appetites and urges that govern our behaviour are generated. Research has shown that these instinctive patterns for responding to the environment are programmed during REM sleep in the fetus and newborn.[4]

When reptiles and, subsequently, mammals evolved, their water-based organs and orientations were coopted to serve other functions. The gill became the inner ear, for example. The water-based instinct for swimming has been retained by virtually all mammals, although in humans it seems to be inhibited by learning to walk on two feet. Crucially, the nerves regulating body movements in fish have been coopted in mammals for social expression, such as facial expressions, muscles movements for hearing and voice production. The water-baby theory, with supporting evidence, suggests that damage to the mammalian templates before or after birth may throw autistic children back on earlier templates, explaining many of their seemingly strange stylised movements and preoccupations, which become explicable when seen in terms of responses to an aquatic environment (see box below). Patterns of REM sleep, which normally accounts for 80 per cent of fetal sleep time and 65 per cent of a newborn's sleep time, are, tellingly, much reduced in children with autism.

Caetextia

More recently, we have turned our attention to what we have termed caetextia (context blindness, derived from a contraction of the Latin *caecus*, blind, and *contextus*, context) to explain the traits of Asperger's syndrome, which involves a triad of impairments in social interaction, behaviour and everyday functioning. Caetextia is the in-

The water babies

IN the article in which Joe Griffin first set out the 'water baby' theory,[1] many characteristic autistic behaviours are related to behaviours that would have been characteristic of our evolutionary marine ancestors. Unlikely as this may seem at first, we should bear in mind that we all spend the first nine months of our lives in a water environment in the uterus; our ears have evolved from the genes for fishes' fins and the nerves that control human emotional expression are adapted from the nerves that control body movements in reptiles and fish.[2,3] The following are just some of the similarities:

- Toe walking, common in autism, makes sense if thought of in terms of fishes' fins (from which feet evolved), which are unbent.
- Descriptions of the autistic children's behaviours almost always include a fascination with spinning, flicking and rocking movements. The autistic child's delight in spinning around and around, without getting dizzy, is explicable in terms of the propeller-like action of the tail fin of a fish.
- Flicking movements, which autistic children often make when holding string or ribbon, can be seen as an effort to replicate the snakelike, undulating movements of a fish as it courses through water.
- When autistic children get excited, they may flap their hands and arms and make facial grimaces. When fish get excited, they gulp in more air, making facial grimaces as they do so, and flap their fins to create more speed.
- Young autistic children don't raise their arms to be picked up, yet love rough and tumble involving being thrown in the air or bounced on a knee. The movement of the fish's tail fin, which repeatedly kicks the fish forward, must create something of the sensation of being bounced on a knee.
- Sudden lunging and darting movements made by autistic children are clearly characteristic of fish behaviour.
- The position in which many hold their arms, with elbows bent and hands close together, is very similar to that of the lobe-shaped pectoral fins of our marine ancestors.
- The love of smooth surfaces may be reminiscent of the smooth feeling of water. Autistic children are usually fascinated by water and want to play with it. They also love shiny, twinkly objects, which might be explained by a predisposition to encounter the patterning of light refracted in water.
- Autistic children commonly refuse to eat more than two or three specific food items; young fish also eat only certain foods and seek these out from an abundant, varied supply of food items. Autistic children often have difficulty chewing; our fish ancestors swallowed their food whole.
- Spatial ability can be precocious, with autistic children able to do jigsaws upside down because they pay especial attention, as many fish do, to shapes.
- Autistic children are often largely insensitive to cold and pain as, indeed, fish are. They have difficulty localising sound and are extra sensitive to movement and sound, which is how they recognise objects (they are sometimes thought to be blind). They pay more attention to what they can touch, taste and smell, than to what they might see or hear. These are behaviours explicable in terms of a water environment.

1 *Griffin, J (1999). Autism: a sea change.* The New Therapist, *6, 4, 10–16.*

2 *Porges, S W (1995). Orienting in a defensive world: mammalian modifications of our evolutionary heritage. A polyvagal theory.* Psychophysiology, *32, 301–18.*

3 *Porges, S W (1997). Emotion: an evolutionary by-product of the neural regulation of the autonomic nervous system. In C S Carter, B Kilpatrick and I I Lederhendler (eds)* The Integrative Neurobiology of Affiliation. *Annals of the New York Academy of Sciences.*

ability to keep track of different variables and perceive the deeper context in which they are embedded, which we believe is the fundamental deficit at the higher end of the autistic spectrum.[5] Again, the REM state is key to understanding it. The evolution of mammals began with the development of 'warm-bloodedness': the ability to maintain a constant internal body temperature, regardless of temperature in the environment. This enabled mammals to move around quickly (unlike reptiles, which can only move easily once their blood has heated up), but required a huge energy output. We posited that mammals would need to have devised a means of controlling impulses that would result in a waste of precious energy – such as pursuing every sound or movement, in case it might be prey, or pursuing prey when themselves the focus of a larger predator. They needed to develop the ability to have ready access to memories, so that events could be matched up to past experiences, and acted on accordingly. ("That rustle is more likely to be the wind in the leaves, rather than a small, tasty animal.")

The development of the ability to suppress impulses that were realised not to be in a mammal's survival interests at that time brought another requirement: the need to devise a mechanism enabling discharge of the emotional arousal caused by unexpressed impulses, so as to restore emotional equilibrium and keep the instincts intact – otherwise, if repeatedly not acted upon, they might become permanently inhibited. Think what a disaster it would be for the future of the species if, for example, the sex instinct were to become permanently switched off. This has led to the development of REM state dreaming, to discharge emotional arousal not acted upon.[6]

All this adds up to the fact that early mammals had to learn to make decisions based on *context*. As we explained in an earlier article on caetextia, "Millions of years ago, mammals evolved, in effect, a biological form of what computer buffs today called 'parallel processing', a mechanism capable of gauging risk by processing multiple streams of current information, at the same time as unconsciously comparing similar, previous experiences with each new one. When we say that the profoundly disabling impairment that runs across the whole autistic spectrum is the inability to perceive context, we mean this mammalian ability to maintain separate streams of attention and switch effortlessly between them to assess the relevance of what is happening."[5]

The direct connection between the REM state and caetextia became apparent when, by chance, Joe's daughter Lily-Beth recounted to him a dream during which it had seemed the most natural thing in the world for her and her friends to be at a nightclub dancing and chatting with horses. It was only when she woke up and recalled the dream that it struck her as bizarre. The REM state in night dreaming is clearly caetextic – we have no context in dreams (for instance, Lily-Beth didn't have access to the background information that humans and horses don't dance and chat together) and thus accept bizarre events at face value.

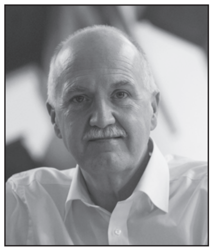
The following are examples of caetextia in the waking state. A university student, on her first morning as a part-time cleaner in someone's house, stripped off to her bra and pants because the day was a hot one, and had no idea that this wasn't appropriate behaviour in the circumstances. A young man, finalising the set-up of a computer system to support a lecture to several hundred people, which was due to start in five minutes, abandoned the task and went instead to remove some bags he had left at the reception desk, because someone had come to tell him that they were in the way. He had no ability to keep both requirements in mind and prioritise.

As the brain became more sophisticated in humans and intelligence developed further, the left and right hemispheres of the brain developed different, if overlapping and interdependent, specialisations. Language and structured thought is primarily ordered through the left hemisphere, while associative and imaginative thinking is ordered through the right. We have observed that caetextic people, who cannot 'parallel process' multiple streams of information, tend to rely on one type of thinking or the other. Someone who is left-brain dominant is likely to rely entirely on logical, straight-line thinking (left-brain caetextia), while someone who is right-brain dominant is likely to show a hyper-associational mind, connecting one thing to the next in a highly disorganised, over-imaginative way (right-brain caetextia). (Although right-brained caetextics are more emotional, they are lacking the emotional instincts needed to discipline associations.)

Psychosis

In the theory we put forward some years ago to explain the bizarre features of psychosis, we suggested psychosis is waking reality perceived through the REM state, and marshalled facts to support this assertion.[7] For instance, in dreams, it is normal to see people and things that are not really there but, if this happens when awake, it is a psychotic symptom. When asleep, we are less sensitive to pain (not realising till waking that we have slept in an awkward position, for instance) and it has also been observed that people with schizophrenia can be relatively impervious to pain. Our theory holds that psychosis arises from extreme stress in highly imaginative people. Again, there is a fault with 'parallel processing', because, in the waking dream state, psychotic people are deprived, as in dreams, of the context to see that what they are accepting as true is actually bizarre.

But is there any physiological evidence for the existence of parallel processing? The answer is yes. The exciting discovery, made through neuroimaging techniques, of a hitherto unknown brain



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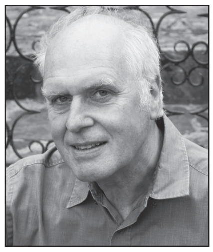

Ivan Tyrrell *is principal of MindFields College and editorial director of* Human Givens.

pattern (since termed 'the brain's default network') and publication of it by researchers Raichle and Schulman in 2001 has set off a raft of research across the world. This has been summarised in a paper published in *Annals of the New York Academy of Sciences* and the following research findings are contained within it.[8]

When the brain is 'relaxing' and not engaged in specific outward activity, researchers have found, it uses up 30 per cent more calories than when it is clearly busy. This energy usage has been tracked to the default network – defined by activity in the medial pre-frontal cortex (which is also active in dreaming) and the posterior cingulate (which is concerned with possibilities and choices). But when the brain focuses outwards, engaging the pre-frontal cortex, it has been shown, the default network is switched off. This network has been discovered in monkeys as well as humans – and it seems likely that it will be found in some form in all hot-blooded mammals, albeit the human ability to switch into it is highly expanded. Research has shown that the default network is most active in humans when we are thinking back over the past, imagining the future and considering other people's perspectives. But it is especially active when we are thinking from a first-person, as opposed to a third-person, perspective.

In one telling piece of research, volunteers were given meaningless words interspersed with an occasional genuine word, such as 'apple'; the default system would momentarily switch on at the sight of 'apple', as the mind wandered to associations, such as apple pie. This is exactly how we have predicted the parallel processor would work – putting information into relevant contexts. As might be predicted from the caetextia theory, the default system has been found *not* to switch on in those with Asperger's syndrome. Equally, it would seem likely that the default system would fail to switch *off* in psychosis. And that is exactly what has been found – experiments show that the default network stays switched on even when people with schizophrenia are focused on *external* reality. The more psychotic people are, the more time they spend in default activity. They are so focused on their own feelings that they too, like caetextics, fail to read others' minds and so develop unrealistic notions.

We would suggest that the parallel processor, or default network, and the REM state must be closely related. The parallel processor doesn't just provide background but is used in personal memory, imagining the future and in 'reading' others' minds. That is what happens in the REM state, as accessing the imagination is essential for perceiving what is not there. We access it in daydreaming and in night dreaming. But, as we have pointed out, the REM state in night dreaming is caetextic – we have no context in dreams and thus accept bizarre events. So how, then, can the REM state and the parallel processor be closely connected? The reason, we suggest, is this. There is a difference between the dream state and the dream: the theatre of REM and the script. A theatre can stage any number of plays but, once a play is chosen and in performance, the actors are locked into the given script. Thus, the theatre of REM is the parallel processor but the dream itself locks attention and is caetextic.

Genetic imprinting

We are suggesting that inability to consider context underlies the experience of both autism and psychosis. Badcock also makes the case for a root cause that can lead either to autism or psychosis. His theory turns on the recent discovery of genomic imprinting, whereby, unusually, certain genes find healthy expression in a child if they come from the mother or the father, but not both. (An imprinted gene is a gene that isn't activated.) Abnormalities result when, in such instances, genes from both parents do get expressed. In one example, related to growth in the womb, it is the paternally active genes that favour greater growth.

Imprinting has developed, Badcock suggests, because there is a competition between the father's interest and the mother's interest. In early terrestrial life forms, neither fathers nor mothers had ongoing involvement with offspring (after the male had donated sperm and the mother had laid eggs). But, once mammals evolved, offspring were nurtured within the mother. She now has a much longer-term commitment and must give an appreciable amount of energy to growing a placenta, nurturing the fetus in the womb, breastfeeding young after birth, and caring for them until they are mature enough to cope alone. So there is a huge genetic investment by the mother, compared with that of the father, whose genetic contribution continues to be the donation of sperm. It might, therefore, be in the father's interest to favour genes that would promote growth for his offspring in the womb, to enhance that particular fetus's chance of survival. But this would be at the expense of the mother, whose interest would be in keeping herself alive and being able to have other children and who would, therefore, want to limit the degree of physical growth of the baby in her womb.

In another example of gene imprinting, a particular form of developmental disorder arises when the mother's copy of the relevant gene is imprinted, but a different one prevails, if the father's copy is imprinted. Badcock provides supportive evidence to show, within these disorders, a clear tendency for the mother's genes, if over-expressed, to push towards psychosis, and the father's towards autism. This is not to say that psychosis is exclusively female and autism exclusively male, rather that autism is the result of male genes being dominant in their expression and psychosis the result of female genes being dominant in their expression, whether expressed in a son or the daughter. Badcock concludes that autism and psychosis are at opposite ends of a continuum. He sees, as we do, that autism is linked to an adaptation of a specific type of intelligence, highly advantageous to the human species, that tends to be more typically expressed in men, and that genes for psychosis relate to artistic creativity, which is more favoured in the female inheritance.

The imprinting theory offers clear support for Joe Griffin's theory that autism is the result of a failure to access, or an inhibition of access to, the mammalian templates. Most imprinted genes are found in the placenta and the brain. Maternal genes are found to be preferentially expressed in the neocortex and paternal ones in the limbic system. Badcock offers the explanation that, because of the mother's need to nurture all her offspring, she had to develop the ability to control the rash consumption of resources and impulsive drives of her offspring and promote cooperation. This mediating of the instinctive brain is indeed a role of the neocortex, which evolved next. But, we suggest, the male had no incentive not to continue with the gene set he already had – he wasn't developing a uterus and he wasn't developing a placenta, so male interests would have been best served by keeping a dominance of the pre-mammalian genes. And that causes conflict. Should the balance be tipped and the male genetic template predominate, there would be curtailment of emotional intelligence and containment of the ability to read other people's minds, etc. If that went too far, mammalian templates might be cut out completely, with a resultant strengthening of the pre-mammalian 'water' templates. (As described earlier, the pathological behaviours in severe autism can be explained as people trying to make sense of reality by using pattern matches to water templates instead of mammalian templates.[3])

To recap, from when mammals first evolved, there would have been a conflict between the pre-existing gene set, which didn't have an interest in emotional intelligence, nurturing and so on and which it was in the interest of paternal genes to keep going, and the new mammalian gene set. It would have been in the interest of maternal genes to weaken that former gene set and to favour emotional and nurturing expression. As we have seen, both sets of intelligence are advantageous.

Badcock doesn't refer to the findings about the brain's default system (the parallel processor, as we have termed it) and the fact that it is hyperactive in schizophrenia and switched off in autism. However, this clearly supports the idea, which he puts forward, that these are opposite ends of a continuum. Where we talk about left- and right-brain caetextia, he talks about psychosis and autism as being sister disorders, because which one manifests depends on whether it is the paternal or maternal genes that are inhibited. These two disorders are like mirror images of each other and, in talking about left- and right-brain caetextia, we ourselves have recognised that left-brain caetextia is about mechanistic thinking, associated with autism, and right-brain caetextia is about hyper-association, which is linked with psychotic tendencies.

Links with the default system

Of course, the terms left- and right-brain caetextia are gross oversimplifications, with the terms 'left brain' and 'right brain' reified to represent the logical and the imaginative mind. It is now more accurate to see these abilities in terms of the default system that has been identified. A person with right-brain caetextia is trapped excessively in the default system (in our terms, the parallel processor or REM daydreaming) and is thus unable to relate the productions of their associative mind to the circumstances they are currently in. They may start telling long, drawn-out personal anecdotes, sparked just by the mention of some innocuous word, such as 'dog' or 'tablecloth', oblivious of the fact that their reluctant listeners need to get on with some task or are looking extremely bored. Conversely, people with left-brained caetextia are, in effect, locked out of their parallel processor and locked into concrete reality and thus unable to relate variables in their current reality to the deeper context in which they are embedded – choosing, therefore, to go and shift some bags instead of finishing the urgent job of setting up the computer system for a lecture.

The default network has been shown to develop over time.[8] It is already evident in children aged between seven and nine, research has shown, but not highly developed (as reflected in the simple dream construction in children). In adults, it is far more complex, and this is no surprise, as we develop over time our abilities to make connections and explore ideas.

Quite clearly, more will soon be discovered, from a scientific perspective, about how the brain's default system operates and, in time, a connection with the REM state may be recognised. In the meantime, we need to use what we now know about genetic propensities and the brain's ability to switch in and out of different kinds of thinking to develop more creative human beings, capable of richer perceptions of how things are interrelated. We need to consider what sort of education will stimulate the default network – but not over-stimulate it. We need to place emphasis in primary education on helping children develop a balance of abilities, and that means recognising the propensities and needs of individual children. We need to know when more time needs to be spent on reading and writing and listening to realistically inspirational stories, to help children develop the imaginative mind, social skills and abilities to read the mindset of others, or more on problem solving and computer work, to encourage a more analytical mindset. We need to find how to get this balance right in the brain, so that the human organism increasingly selects for it, because the future survival of the species may depend on it. ■

REFERENCES

1 *Fitzgerald, M (2003).* Autism and Creativity: Is There a Link Between Autism in Men and Exceptional Ability? *Routledge.*

2 *Badcock, C (2009).* The Imprinted Brain. How genes set the balance between autism and psychosis. *Jessica Kingsley, London and Philadelphia.*

3 *Griffin, J (1999). Autism: a sea change.* The New Therapist, *6, 4, 10–16.*

4 *Jouvet, M (1978). Does a genetic programming of the brain occur during paradoxical sleep? In P A Buser and A Rougel-Buser (eds)* Cerebral Correlates of Conscious Experience. *Elsevier, Amsterdam.*

5 *Griffin, J and Tyrrell, I (2008). Parallel Processing.* Human Givens, *15, 4, 11–17.*

6 *Griffin, J and Tyrrell, I (2004).* Dreaming reality: how dreaming keeps us sane or can drive us mad. *HG Publishing, East Sussex.*

7 *Griffin, J and Tyrrell, I (2001). Trapped in the land of illusion.* Human Givens, *8, 3, 2–3.*

8 *Bucker, R L, Andrews-Hanna, J R and Schacter, D L (2008). The brain's default network: anatomy, function and relevance to disease.* Annals of the New York Academy of Sciences, *1124, 1–38.*