

girlfriend's father. Most of all he swings between moods superbly high and desperately low. He can be tender to his girlfriend, Ophelia, but then cruel ("Get thee to a nunnery: why wouldst thou be a breeder of sinners?") and almost violent. His wit and insight is second to none but can manifest in extreme talkativeness and an inability to assess danger. He is also indecisive.

Under the latest edition of the *Diagnostic and Statistical Manual of Mental Disorders*, Hamlet's symptoms suggest bipolar disorder – an assessment that makes sense to Farah Karim-Cooper, a scholar at Shakespeare's Globe theatre in London. "You can see evidence of his mood swings and rage in his chamber with his mother, and in his exchanges with Ophelia," she says.

6. Name: **CORIOLANUS**

Description: Blood-thirsty army general, disastrous politician

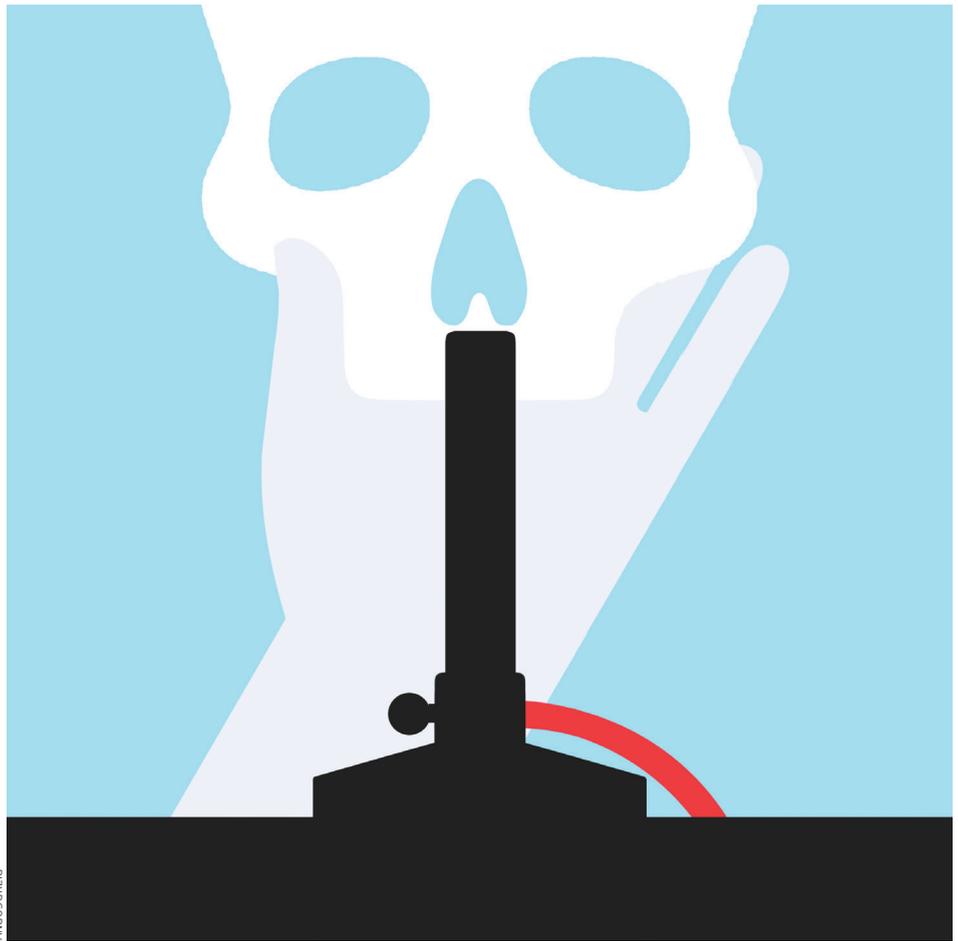
Supporting quote: "Despising, for you, the city, thus I turn my back: There is a world elsewhere."

Coriolanus is a classic case of how brilliance in one field, soldiering, doesn't necessarily translate to another, politics. "Many productions emphasise Coriolanus's inability to understand the politics of the real world and the necessity of custom even when you think it's pointless," says Erin Sullivan of the Shakespeare Institute in Stratford, UK.

Coriolanus has an extreme lack of social aptitude, and a lack of empathy: he is "a kind of nothing". It could be argued, too, that he has a desire for routine, a desire that is frustrated when he is exiled. "They are trying to thrust him out into the crowd, they want him to make nice and he just doesn't want to do it," says Karim-Cooper. "That's often attributed to his pride and sense of social superiority, but perhaps you could read it as a slightly autistic trait."

But maybe that illustrates how we bring our own cultural and scientific baggage to the Bard. No doubt in 100 years there will be different interpretations again. Perhaps that, more than anything, shows the richness of Shakespeare's plays. ■

Rowan Hooper is news editor at *New Scientist*



With profits of the mind

Shakespeare's appeal lies in an intuitive understanding of how our brains work, says **David Robson**

IT PROMISED to be a marriage of true minds. "My dream is to understand how Shakespeare moves the brain," literature professor and psychologist Philip Davis told Guillaume Thierry when they first met. Could Thierry, a neuroscientist, help?

Thierry was initially nervous about braving the sound and fury of Shakespeare scholarship. "It's a minefield," he says. But the pair persevered, and joined a small cadre of researchers using quantitative techniques to examine the playwright's talents – be it his vocabulary, subtle wordplay or astute understanding of audience psychology.

Properly controlled statistical analyses have already busted long-standing myths about the Bard. For centuries, scholars had argued that he was fishing from a particularly large word pool compared with his peers. ➤

But when Hugh Craig at the University of Newcastle in New South Wales, Australia, took into account factors such as the number of plays each writer had produced, he found that Shakespeare's vocabulary is no larger than that of his contemporaries Christopher Marlowe, Thomas Middleton and Ben Jonson (*Shakespeare Quarterly*, vol 62, p 53). His overall mix of terms is also no more complex than that of his contemporaries, and his rate of coining new words is unremarkable.

Cudgel thy brains

So what is the essence of Shakespeare's peculiar genius? "If I was being a romantic, I would say that one reason for his greatness is that he perfectly captured the way people expect others to speak," says Craig. Or, as the man himself wrote: "So all my best is dressing old words new/Spending again what is already spent".

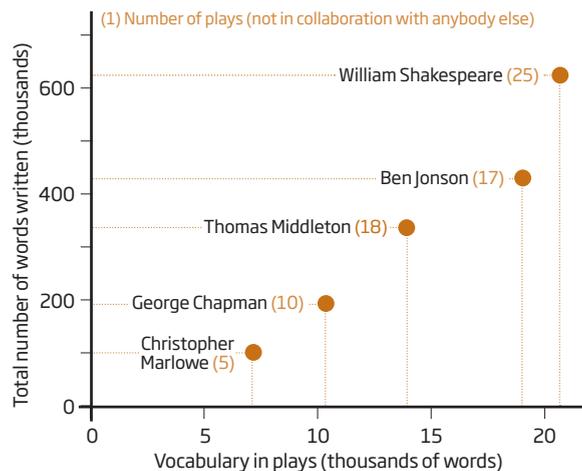
It was an idea that motivated Davis and Thierry's collaboration. They concentrated on a characteristic feature of Shakespeare's style – his extensive use of "functional shift", changing the grammatical class of words to fit his purposes. When Iago is convincing Othello of his wife Desdemona's infidelity, for example, he tells him "'tis the spite of hell... to lip a wanton in a secure couch", lasciviously replacing the verb "kiss" with the noun "lip" while using "wanton", an adjective, as a noun. "Other Elizabethan writers used the device, too, but Shakespeare was addicted to it," says Thierry.

Thierry was stunned when he saw the tempest this small grammatical twist unleashed in the brain. His EEG and fMRI scans showed that Shakespearean sentences employing functional shift triggered greater activity in areas of the brain normally associated with emotion and autobiographical memory, as well as in the basal ganglia, an area sparked when bilinguals switch between languages (*Cortex*, vol 49, p 913). "He was forcing the brain to reason and to function more – to process information at a deeper level," says Thierry, who is based at Bangor University in the UK.

Davis, who works at the University of

Master of words

Shakespeare's vocabulary has long been considered to be unusually large – yet this could just be due to the fact he also wrote many more words overall, giving him the opportunity to show off more terms



Liverpool just along the coast, was intrigued that the neural activity lingered long after the sentence had finished, and points out that Shakespeare often uses functional shift at a scene's turning point. "It primes the brain for the 'wow' moment," he says. "It heightens the drama."

But it's not just the words: Shakespeare's stage directions show an acute understanding of the human mind, too. Evolutionary psychologist Robin Dunbar at the University of Oxford has shown how our real-life

SHAKESPEARE'S SMALL GRAMMATICAL TWISTS UNLEASH A TEMPEST IN THE BRAIN

social interactions are constrained by keeping track of many people's mental states at one time. Only if three people or fewer are present will we gossip about others' thoughts or feelings, seemingly because we can keep track of the reactions of those present while still contemplating the mind of the absent party. With four or more participants, we tend to restrict ourselves to less controversial themes such as the weather. "You need to know if you're in like-minded company

before you say someone is a complete prat," explains Dunbar.

In a paper currently under review, Dunbar and his colleague Jaimie Krems at Arizona State University in Tempe have analysed Shakespeare's stage directions to show how he constrains his characters' conversations in a similar way. Typically, just two or three people will discuss another character's thoughts and feelings – such as Desdemona's fatal affection for Othello's lieutenant Cassio – whereas four or more speakers will talk about more general topics, such as events in a war. "It's an indication of what a great observer he was," says Dunbar.

Dunbar suspects other playwrights were less consistent in hitting that sweet spot. *New Scientist's* own back-of-the-envelope analysis of Christopher Marlowe's *Tamburlaine The Great Part I* supports this assertion: just half of the conversations about the feelings of an absent character take place between two or three people, whereas 90 per cent of Shakespeare's scenes follow the rule.

A further point of interest is the longer-term chains of understanding Shakespeare builds between different characters. To grasp the plot of *As You Like It*, for instance, we need to follow that Silvius is in love with Phoebe, who shuns his affections in favour of the cross-dressing Rosalind, who, in turn, is trying to woo Orlando. That takes brain power – and Dunbar suspects that Shakespeare was particularly good at creating dramas that push us to our limits without overstepping them.

For Dunbar, these musings are the prelude to a three-year project in which he will study the psychology of the theatre. Perhaps such initiatives might bring us closer to Davis's goal of understanding how the English-speaking world's greatest playwright moves our minds. Certainly he feels his experiments in neuroscience have helped. "It's offered me a whole new language for thinking about my intuitions and responses to drama," he says. "We literary scholars need to do more experiments that are verifiable and controlled." Perhaps it is a brave new world of Shakespeare studies. ■

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