

The Neurology of 'Alice'

The Reverend Charles Lutwidge Dodgson (1832–1898) has been immortalised as Lewis Carroll, the pseudonym under which he published a number of books, amongst them the two classics *Alice's Adventures in Wonderland* (1865) and *Through the looking-glass and what Alice found there* (1872). These works have been of interest not only to children of all ages but also to neurologists since some of the phenomena they describe, or seem to describe, may be deemed suggestive of neurological conditions, a subject which has been previously discussed.¹

"Alice in Wonderland" syndrome

The name "Alice in Wonderland" syndrome was coined by Todd in 1955 to describe the phenomena of micro- or macrosomatognosia,² i.e. altered perceptions of body image, which had first been described by Lippman in the context of migraine some years earlier.^{3,4} It has subsequently been suggested that Dodgson's own experience of migraine, recorded in his diaries, may have given rise to his descriptions of Alice's changes in body form, so graphically illustrated in *Alice's Adventures in Wonderland* by Sir John Tenniel. These have been interpreted as somesthetic migrainous auras.⁵ However, Blau has challenged this interpretation on chronological grounds, finding no evidence in Dodgson's diaries for the onset of migraine until after he had written the Alice books.⁶ Moreover, migraine with somatosensory features is rare, and the diaries have no report of migraine-associated body image hallucinations.⁴ Podoll & Robinson have discovered an earlier drawing by Dodgson suggesting that he did in fact suffer migraine aura symptoms before writing the Alice books,⁷ but the illustration suggests a right paracentral negative scotoma rather than micro- or macrosomatognosia.

Other conditions may also give rise to the phenomena of micro- or macrosomatognosia, including epilepsy, encephalitis, cerebral mass lesions, schizophrenia, and drug intoxication.⁸ It may be speculated that the latter is relevant to Alice since her experiences occur after drinking from a phial ("DRINK ME") and after eating cake ("EAT ME").

Stammering

Dodgson had a developmental stammer. Although ordained a deacon, his unwillingness to preach and to progress to holy orders has been attributed to his speech defect.⁹ Carroll parodied this defect in the character of the Dodo ("Do-do-Dodgson") in *Alice's Adventures in Wonderland* (chapters 2 & 3).

Mirror phenomena

Like Leonardo da Vinci, Carroll was a noted mirror writer, penning occasional "looking glass" letters.^{10,11} The poem Jabberwocky first appears (*Through the looking-glass*, chapter 1) mirror reversed, in a Looking-glass book; only by holding it up to the

mirror is Alice able to read it.

Mirror writing may be associated with stammering, and is much commoner in left handers: Dodgson apparently wrote with his right hand but may have originally been left handed.¹⁰ Gardner states that Dodgson was "handsome and asymmetric – two facts that may have contributed to his interest in mirror reflections. One shoulder was higher than the other, his smile was slightly askew, and the level of his blue eyes not quite the same."⁹

Schott notes that Carroll's mirror letters were written in varying styles, and differed from his normal script, unlike the situation with Leonardo whose two scripts were faithful mirror images,¹⁰ and hence argues that Carroll's letters reflect not an inherent capacity but a contrivance, designed to amuse children who corresponded with him.^{10,11} Hence the neural mechanisms of mirror writing, whatever they may be (hypotheses include bilateral cerebral representation of language, motor programmes or visual memory traces or engrams^{10,12}), may differ between Carroll and Leonardo. The literary device of mirror letters has been used by other authors writing for children.¹³

"Mad Hatter syndrome"

The consequences of poisoning with inorganic mercury include a mild sensorimotor peripheral neuropathy, a syndrome which may resemble motor neurone disease, tremor (often circumoral), stomatitis, skin rash, and a neuropsychiatric syndrome characterised by timidity, seclusion, easy blushing, irritability, quarrelsomeness and mood lability (erethism). Hatters were liable to such problems because of the use of mercury in the felt hat industry as a stiffener of rabbit fur, leading to the expression "as mad as a hatter". Hence it might be

assumed that Carroll's Mad Hatter is "mad" because of mercury exposure.^{14,15} However, as Waldrom pointed out,¹⁴ odd though his behaviour certainly is, the Mad Hatter displays none of the typical features of mercury poisoning, either at the mad tea party (*Alice's Adventures in Wonderland*, chapter 7), or during his appearance as the King's Messenger Hatter in *Through the looking-glass* (chapters 5 & 7). Tenniel's illustration of the Mad Hatter/Hatter is said to resemble one Theophilus Carter, a furniture dealer near Oxford, who was known to Dodgson, and known in the locality as the Mad Hatter because he always wore a top hat and was prone to eccentric ideas.^{14,16}

Prosopagnosia

Humpty Dumpty, encountered in *Through the looking-glass* (chapter 6), is one of Carroll's most enduring characters, remembered principally for his famous definition of the meaning of a word ("just what I choose it to mean"), and his coining of the term "portmanteau word" ("two meanings packed up into one word").



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A re-reading of the encounter between Humpty Dumpty and Alice indicates two passages alluding to facial recognition: initially when Alice makes out that the egg has the face of Humpty Dumpty, and then at parting when Humpty Dumpty says he would not be able to recognise Alice if they did meet again: "Your face is the same as everybody has". On the basis of this latter passage it has been suggested that Humpty Dumpty may suffer from prosopagnosia, a rare form of visual agnosia characterised by impaired recognition of familiar faces or equivalent stimuli.¹⁷ Sadly this hypothesis is not amenable to empirical investigation since Humpty Dumpty apparently suffered irreversible traumatic injuries in falling from a wall, thereby confounding any further assessment.

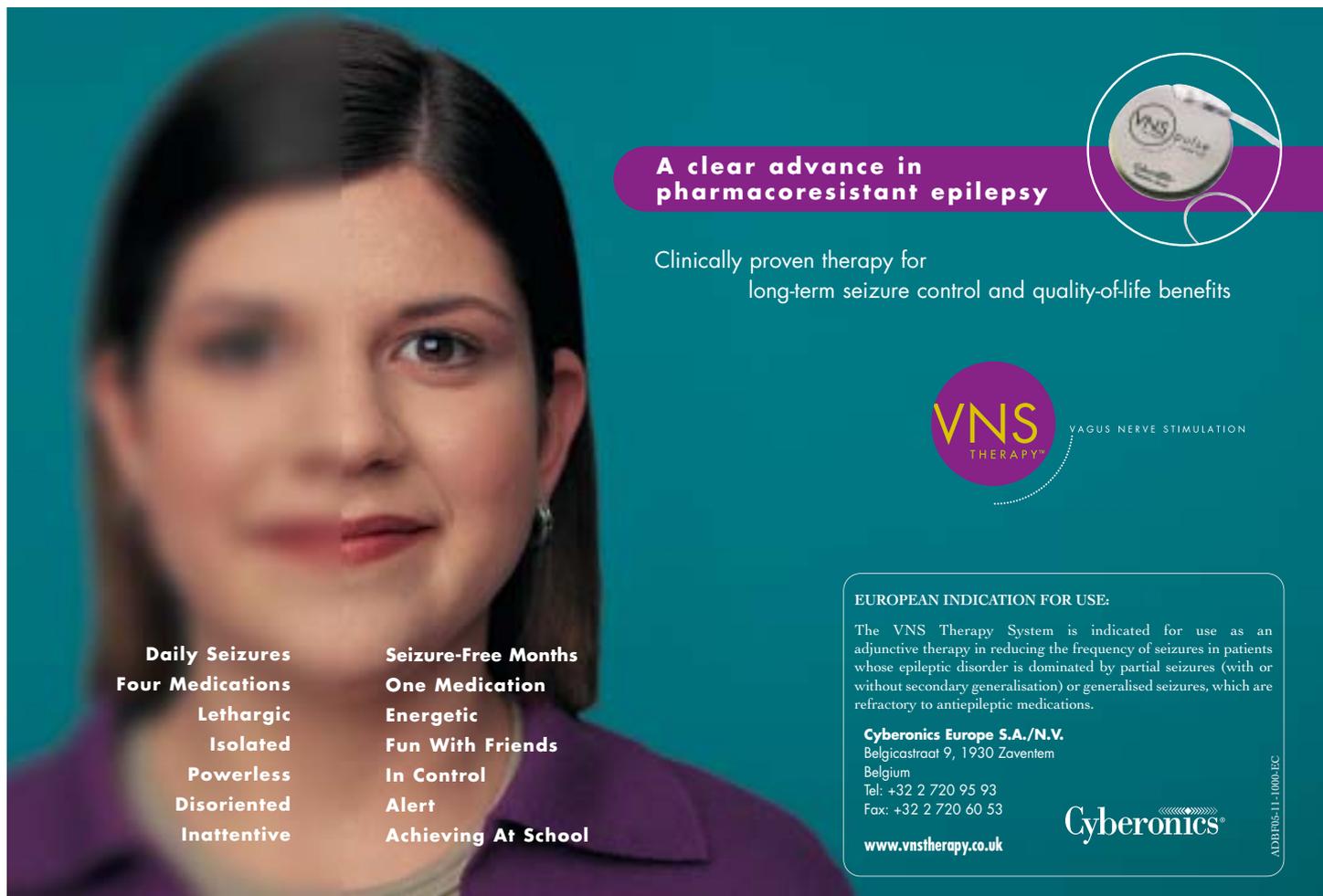
Questions for future study?

In *Alice's Adventures in Wonderland*, is the Pool of Tears (chapter 2) a consequence of pathological crying? At the mad tea party (chapter 7), does the dormouse suffer from excessive daytime somnolence, and if so is there an underlying neurological cause? Does the very ugly Duchess (chapters 6 & 9) have a dysmorphic syndrome, perhaps with behavioural features to explain her neglectful treatment of her baby?

In *Through the looking-glass*, The Red King (chapter 4) and both the White and Red Queens (chapter 9) snore whilst they are sleeping: might they have obstructive sleep apnoea-hypopnoea syndrome? Does the White Queen's statement that she "can't do subtraction under any circumstances" (chapter 9) reflect a selective acalculia?

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