INTERVIEW

The blogging Bishop of neuroscience

Dorothy Bishop (University of Oxford) talks to Lance Workman about tweeting, blogging and childhood disorders

Today you are well known for your research on specific language impairments (SLI) in children – did you set out to specialise in this area?

Like most of my career, it wasn't planned at all. I was always interested in neuropsychology and had been fired up by hearing Hans-Lukas Teuber give a series of guest lectures when I was an undergraduate in experimental psychology at Oxford University. When I completed my undergraduate degree I was quite uncertain what to do next. I applied for a doctoral studentship in the field of animal behaviour, which I didn't get, but I was successful in getting a place at the Institute of Psychiatry in London to do clinical psychology, which in those days was a two-year MPhil. In neither my undergraduate degree nor on the clinical course did I do very much with children. After London, I had a great opportunity to return to Oxford to work with Freda Newcombe at the Neuropsychology Unit in the Radcliffe Infirmary. I was fascinated by aphasia and really wanted to do a doctorate in adult neuropsychology, but Freda steered me towards developmental disorders, and once I had seen a few language-impaired children I was hooked. It was a great opportunity because virtually nothing was known about children's language impairments at that time, and so I could pretty much make a fresh start.

You approach SLI from a number of different angles from linguistics, neurophysiology, genetics and neuropsychology. Do you find you have to be jack-of-all trades here?

It's both a curse and a blessing of working in this field that it encompasses such a wide range of disciplines. It is virtually impossible to master everything you need to know in psychology, even without branching out into other subject areas. So I am continuously working right at the edge of my competence and in grave danger of making mistakes. And I've found that some of those areas are ones where it's all too easy to think you understand something and find you have got it fundamentally wrong. I've benefited from good colleagues in genetics who have helped enormously by checking what I write and explaining things to me when I misunderstand.

Linguistics I find a lot harder – I am fascinated by language, but it's not always easy to get yourself into the mindset of some of the more hardcore practitioners. I still remember the first article I ever read by Chomsky, which made no sense to me at all: he seemed to be arguing that you first worked out the grammatical structure of your utterance before deciding what you wanted to say. The more I read of his writings, the more I feel he's actually held back our understanding of child language learning, because he makes some fundamental assumptions that are misguided. Thankfully, there are now many linguists who reject his approach and whose ideas I find more congenial.

I'm more at home with neurophysiology – I have a geeky side and have always liked programming, so the more complex forms of data analysis don't put me off. But I've now reached an age where I think I can't learn any more new skills – it's hard enough keeping up with the areas I have tried to master!

The real upside of being a jack-of-all-trades is that it does allow you to see links between different areas. While I had expected that psychological insights on language impairments might lead to more sophisticated genetic analysis, I hadn't anticipated that the genetic analysis would alter how I thought about psychology. Yet in practice, I found that having a genetically informed perspective really sharpened up how I thought about causal processes.

I realise I am fortunate in being able to devote time to mastering new skills: I am enormously grateful to the Wellcome Trust for funding me on a Fellowship that gives me time to do full-time research, as without this I'd have had to pursue a far more limited range of research.

One quite specific area that you are interested in is somewhat controversial 'auditory processing disorder'.

Auditory processing disorder (APD) is a concept developed by the audiology profession, based on observations that adults with an acquired brain lesion can be impaired at distinguishing between sounds, even though they can detect them. It's sometimes described as an auditory analogue of colour blindness. A rather wide range of symptoms has been described, ranging from problems in detecting speech in noise, problems integrating information from the two ears, or impaired ability to discriminate sound qualities such as pitch, intensity or duration.

The controversial bit comes from the extension of this idea to children. The assumption is that the same brain regions that cause problems when lesioned in adults might fail to develop normally and so lead to problems with processing sounds. These in turn could affect a child's ability to learn to talk or read. The problem is that children can fail auditory tests for all kinds of reasons, and the traditional APD approach ignored many of these. For instance, if you give a child a test of discriminating speech in noise, they may do poorly because they have limited language skills. Most audiologists seem to work with a limited bottom-up view of auditory function and so don't appreciate the possible role of top-down higher cognitive influences on test results. Matters are complicated further by the fact that in the USA and Australia, APD is big business, with private practitioners charging large sums to assess and diagnose children, and offering intervention packages that have little if any empirical support. I don't want to throw the baby out with the bathwater, and I continue to investigate the role of auditory processing in children's language and literacy problems, but I think this explanation has been over-hyped and that the diagnosis seldom helps in getting the child appropriate intervention.

You are also interested in the relationship between handedness and developmental disorders – why should there be a link between the two?

The idea goes back many years, at least to the 1930s when Samuel Orton postulated that confused laterality was associated with dyslexia and language problems. There has been a mountain of research since that time, most of it negative, but the idea won't go away. I guess the basic idea is that laterality evolved because it was an efficient mode of cerebral division

of labour, and that people who are less lateralised are therefore likely to have less optimal brain organisation. My own view is that handedness is not going to tell us very much – it is far too indirect an index of cerebral lateralisation. Unfortunately, it is a very easy measure to throw into a study, and I think there's a massive file drawer problem, with people just reporting studies where handedness shows up as significant.

I'm more optimistic, though, that there may be something in the idea of a link between language lateralisation and dyslexia or language impairment. The research evidence from brain imaging remains rather inconsistent, but we've now had two studies from our group using functional transcranial Doppler to assess blood flow to the two sides of the brain while doing verbal tasks, one with dyslexia and one with SLI. In both, we found reduced lateralisation for language. It's early days, but it's made me think we should do more before abandoning the idea. However, we do also have people in our studies who have weak or reversed language lateralisation and who are doing just fine, with no evidence of any cognitive impairments.

Would you say that things have progressed rapidly in our understanding of the genetic and neurological factors involved in SLI in recent years?

Yes, but things are turning out much more complicated than anyone anticipated. I think we all started out thinking, for instance, that we might find a gene for language impairment. Everyone got very excited when a three-generational family was found in whom a severe speech and language impairment showed perfect co-segregation with a mutation in the FoxP2 gene. However, it soon became clear that this family was highly unusual, and the vast majority of people with SLI don't seem to have any genetic mutations. Most people now seem to think that both SLI and dyslexia are complex multifactorial disorders, which means that the overall level of impairment is determined by the combined influence of many small genetic and environmental risk factors. And to make matters worse, there's also likely to be a great deal of heterogeneity. It may help that we can now get high-resolution images of the brain in living children – something that could hardly have been dreamed of when I started out in the field in the 1970s. And genetic methods are moving ahead at breathtaking speed. But these new technologies bring their own problems with them – in both genetics and neuroscience we are finding that it is possible to have too much information.

Yes I can imagine there can be overload! Moving on to perhaps a simpler form of information, you are a keen blogger [see p.12] and tweeter. What appeals to you about that?

With blogging I get a chance to say what I think, and to interact with a much broader spectrum of people. I blog about a range of stuff – much of it is me letting off steam about issues that wind me up, but I also try to write pieces that explain the science to a more general readership. I also like the fact that I can wake up in the morning with an idea, write 800 words or so, post them on my blog, and get comments from other people the same day. I've been pleasantly surprised at the extent to which my blogging has generated serious academic debate – e.g. about methods used in brain-imaging – as well as more light-hearted interactions. Twitter is another surprise – I had, like many people, thought it was used only for trivia, but in fact if you follow the right people, you can be kept up to date with latest developments in a field far more efficiently than by any other means. It can also be enormous fun, having an intelligent, like-minded group of gossipy people continually to hand.

It's almost as if there are two Dorothy Bishops – the serious academic and the perhaps less serious blogger, tweeter and writer of humorous crime fiction.

The novel-writing, tweeting and blogging all began in the space of a few months in 2010, and I did feel as if a side of me that had been long suppressed was at last released. I had never intended to write a novel, but I started in the middle of a snowy spell when I was just back from Australia and far too cold and jetlagged to do any serious work. To my surprise, I found I just loved composing a story, and it was enormously satisfying to be able to write without worrying about the need to be concise or accurate. If I got stuck with the plot development, I could just change a character completely. It's all me, I guess, but the non-academic activities have definitely liberated a long-suppressed Dorothy Bishop.

In relation to blogging and tweeting – you had a bit of a disagreement with Susan Greenfield recently about the causes of autism.

I was in two minds whether I should say anything, but I am glad I did. The problem was that Susan was implying very strongly that internet use might be responsible for the rise in autism, and this was just nonsense, because the first signs of autism are typically evident by two years of age. It's possible that toddlers these days are using iPads, but that wasn't true for the period she was talking about. And I had done some work on the 'autism epidemic' which was consistent with the view that at least part of the increase was due to changing diagnostic criteria. But the main reason I felt I had to speak out was because I knew just how hard it is for parents of children with autism to make sense of their child's condition. I'm sure Susan meant well and thought she was just making a novel suggestion that could provide a way forward, but the net result would be just to add to the mountain of autism theories, and to do so in a way that could potentially just increase parental guilt. Overall, I think if you are in the public eye as an expert neuroscientist, you need to be very careful when talking about serious conditions that affect real people.

And finally, I get the impression you're not keen on jargon – is this just an irritation or do you think it has an adverse effect on academia?

My heroes are people who write in clear, simple prose. One of my favourite books is Joseph Williams on *Style: Ten Lessons in Clarity and Grace* and I re-read sections of it regularly in an attempt to improve my writing. It's not just management-speak I dislike, but any kind of obfuscation or wordiness. And yes, it has an adverse effect by interfering with clear thought!