The face is familiar

Lance Workman talks to **Vicki Bruce** about perception, £1 coins, dogs, and more

Bruce – that's a Scottish name, right? Can you trace your line back to Robert the Bruce?

Apparently so, through the female line – but so can about 10 million other people! My great-grandfather left Scotland at the time of the clearances and went to Canada. But my family actually has four roots in Scotland, England, Germany and France: four different nationalities when it comes to my grandparents. My Canadian father came to England during the war. So I wasn't brought up in Scotland, although I have spent a fair bit of time there.

You've been an academic psychologist all of your professional life. Did you foresee this when you started your first degree at Cambridge in the early 1970s?

Absolutely not! I went to Cambridge to do natural sciences. Incidentally, I didn't want to go at all, I was dragged there kicking and screaming by my father who was very keen to have a daughter go to Cambridge. I wanted to do a modular science degree – but I didn't know what science I wanted to specialise in. I did not distinguish myself in the first year with a variety of subjects like chemistry. But I picked up psychology – which I knew nothing about – in the second year. I immediately fell in love with it, and it's been a sort of love affair ever since.

Were there any particular influences as an undergraduate at Cambridge?

The first and foremost was a wonderful man called Arj Sahgal – he was my first tutor in experimental psychology. He was the most encouraging, enthusiastic man. I did my undergraduate psychology project with Mike Morgan, and that led to my first publication – but Mike really had to rerun the experiments over the summer first! But he was also a wonderful mentor. And John Morton, who taught me, and after the seminars a small number of us would go off to the pub and talk for hours. So there were many influences. I should also mention Oliver Zangwill, who was very kind and encouraging to me as an undergraduate – especially when I was very neurotic around at the time of my finals. At that time it was a department full of really quite young lecturers who have all gone on to do amazing things. Of course Sue Iverson was also influential and one of the few women at that time. She was both helpful and a great role model.

You're probably still best known for your influential model of face recognition with Andy Young. What would you say was new about that model?

I think the really important thing we were saying in that model was that face perception is not a unitary thing. If you are asking 'Are faces special?' or want to understand face recognition you have to be absolutely clear what you are talking about and what particular task you're interested in. So one of the most important aspects of the paper was the distinction between recognising people from their faces and understanding other things from their faces, such as emotions or understanding facial speech.

Another important feature of that paper, which sadly Andy and I feel some still haven't understood, is that an awful lot of work on face recognition just tells you about how people remember pictures of faces: not necessarily how we recognise people from faces that we've seen in more than one context. So we saw a distinction between memory for unfamiliar faces and remembering the identity of people that we know.

More recent work by a number of people, including myself, has underlined that distinction even more. We are truly terrible at doing things with once-viewed unfamiliar faces. Even if there's no memory load, when simply comparing two different faces people make an enormous numbers of errors. Two images of the same person can look very different and two images of different people can look very similar. Somehow the brain manages to derive a representation of people we know that transcends any individual image.

Another important aspect of that paper, I think, was that we talked about the importance of converging evidence from a number of different sources – neuropsychological, experimental and neurophysiological. Unless you have this converging evidence you probably won't get the right understanding of what different bits of the brain are doing.

Finally, although it was very broad brush, it did actually have falsifiable statements in it. What is rather pleasing is how well the model stood up to later testing. Not all of it – it has evolved into a cognitive neuroscience-based model which is I think rather different – but it retains much of its principles.

You mentioned cognitive neuroscience there – if I'm looking at a face for recognition, does that mean that I'm using quite different parts of my brain from when I'm looking at a face for emotional information?

That's a very good question. If you are looking at a face, lots of bits of the brain will be involved and you won't really be able to turn bits off that go beyond just recognition. But it is the case that rather different bits of the brain will be involved in those different processes. In fact, there is quite strong evidence that there are at least two different parts of the cortex involved in processing faces – the fusiform face area seems to be involved in understanding static face-like objects that belong to a particular category. So this may be involved in identity. The superior temporal solcus appears to be more involved in processes that are dynamic and that might be important for understanding visual attention and expressions. Then there are a number of other bits of the brain involved in emotional recognition, like the amygdala. So there's rather complex extended neural networks doing different sorts of specialist tasks involved in processing faces.

The tip-of-the-tongue phenomenon is an interesting one – we forget the names of things, but we also forget the names of people. Is that a different sort of tip-of-the-tongue syndrome to when

> "the brain manages to derive a representation of people we know that transcends any individual image"

you see a face and you know whose it is, but you can't retrieve the name?
There is a rather interesting conundrum about why proper names are so particularly difficult to remember and there have been various attempts to explain that. None of them is wholly satisfactory. But I'll tell you about two bits of work that are interesting in relation to this. One is by Andy Young and colleagues called 'the Baker baker experiment', based on an idea we had in a pub once. This shows that if you have to learn something associated with a face, such as 'this is a baker', you are much better at remembering that than if you tell someone this person is called Mr Baker. So the same word becomes more difficult

if it is somebody's name compared to when it is a job title for example.

Another experiment that is interesting in relation to the tip-of-the-tongue phenomenon was done by Tim Brennen and a couple of then undergraduate students. Tim came into my office one day and said, 'You know your model? Suppose you're playing Trivial Pursuit and you're asked the question "Who was the nervous young man who murdered the girl in the shower in *Psycho*?", and you say "I know… but I can't think of his name".' Now according to our model, at that point you should be at the person identity node but you can't get the name. So Tim said, 'If your model is right, if you're then shown a face it shouldn't help you, because you are already at that stage.' Well, we could test that. So he asked two undergraduates – Jim Bright and Thom Baguley – to do the experiment. When you got to the tip-of-the-tongue state you were either shown a face or you were asked the question again. What they found was that showing the face didn't help at all – it was no better than asking the question again. People said, 'Yes I know what he looks like, that isn't helping me!'

So this sort of evidence helped to substantiate the model at that time. Eventually following another two experiments we published the finding in *Memory and Cognition* by Brennen, Baguley, Bright and Bruce – we call it the 'four B's paper'. I'm a great believer in publishing with undergraduates – everybody wins.

Yes, I believe all the authors on that paper went on to successful academic careers. But you've managed to go beyond even that – people might be surprised to hear that you were involved in the design of the £1 coin!
That's right. My work here has probably only attracted about five citations, and three of those were from me! But in fact this work has had more of an effect on more people that anything else I could possibly have done, as it's partly my fault that people have to lug around such heavy coins in their pockets!

When the first decimalisation of currency occurred back in the 70s Pat Wright at the Applied Psychology Unit evaluated different forms of the 50 pence piece. I borrowed some of their methods in the work we did in Nottingham. Before the introduction of the pound coin the Royal Mint came to Nottingham because it had a very strong reputation of working with disabled groups including a blind mobility research group. The then head of department, Ian Howarth, asked me if I would take on the project, looking at different options for what was going to be the pound coin and the 20 pence coin. One interesting thing we found with the pound coin was that it was easily distinguishable from the larger five pence coin that was circulating at that time by sight in good light and by touch, but in dim light they were confused. This is because in dim light vision dominates and they became confusable because you can't distinguish their colours. So we had to make the pound coin a bit thicker than had been intended in order to avoid confusion in dim light. That's why the coin is as fat as it is today. I'm very proud of that, even though people who carry them around complain about how heavy they are.

We also looked at the 20 pence coin and in particular at how many sides it had. It had been discovered that seven was by no means ideal for the 50 pence coin, but seven-sided coins rolled better in machines. We looked at all sorts of

aspects such as different number of sides and various ways to enhance the border of the coin, but nothing made any real difference. But when I had the first minted 20 pence coin in my hand, I said 'That's not the coin we tested!', because they had rounded the corners off. They said it was a bit difficult to mill it with sharp corners, and they asked 'does that matter?' In fact it does – people got it confused by touch with the 1p coin. So some of my suggestions were taken up and had an effect and others weren't.

When I contacted you, I give you a brief description of myself. I said I'm tall and skinny with dark, slightly greying hair. Afterwards I thought I should have asked you, the expert… which features should I have described?
Actually, when we meet unfamiliar people the things we pay attention to are broad external features. You could have told me anything you like about your eyes or nose and it wouldn't have made any difference at all. So it worked – you got it right.

Good – I feel exonerated! And finally, what's next for Vicki Bruce?
I've just spent six years in Edinburgh in a senior management role, which gave me very little time to do psychology. But I used to sneak off to Stirling to continue psychology, and happily this enabled me to keep enough going that I didn't drop out. I'm now in Newcastle as head of a school of psychology and back doing a fair bit of research and teaching.

One thing that particularly interests me is this sense of other minds that you get from faces. I'm particularly interested in the ways that people get support from non-verbal behaviour in companion animals and I'm interested in the ways that dogs in particular are kind of parasitic on human non-verbal behaviour in a way that makes us think that it's a bit like having a person around. Dogs do very interesting things with their faces that most other animals don't. When a dog gets stuck on a problem – maybe it's lost its toy under the sofa – what they do that most other animals don't do is come and look at you. Dogs do things that are part of shared attention between people. So that's one of the things I'd like to do more research on – social cognition across species. I think by understanding how people interact with companion animals we will be able to understand just what we can and can't get from a robotic aid. The other thing that is ongoing is that Andy Young and I are co-writing another book on face perception, that will probably come out next year. So plenty going on for me right now!