What are the main aims of your current research?

It was almost 20 years ago that I started my research into the colour vision of horses and, since then, mine and other studies have provided considerable evidence that yellow and blue are the colours this species perceives as most colourful. My current research aims to evaluate the impact of visual features on the behaviour of the horse in both ridden and management situations. Since the environment is currently analysed from the perspective of human vision rather than that of the horse, differences in vision between horses and riders could contribute to the occurrence of behavioural problems in the horse and may result in accidents or falls in ridden work. Together with my colleagues, I am therefore attempting to find out more about what horses see in order to allow us to present their environment in a way that facilitates management and performance and improves the safety of both horse and rider.

How did you become involved in equine research?

Back in 1988, I had gained my British Horse Society Intermediate Instructor qualification and was lecturing part-time in horse behaviour. At this point, I was considering a move into research. The idea to focus on horse colour vision emerged from a discussion with a colleague – at the time, I wondered why we didn’t know the answer to what seemed to be a simple question. I then approached the University of Nottingham’s Psychology Department.
Department in the UK (where I had completed my first degree) and was accepted as a research student. It took about eight years to complete the research and, during this period, I continued my lecturing role.

Could you explain why, on a personal level, your research is important to you?

I am passionate about this research because of my interest in riding and my desire to understand the world from the horse’s point of view. At home, I have two Lusitanos, an Andalusian and a Shetland pony; I continuously try to improve how I train, handle and ride them. Too many people fail to appreciate how different the world around us looks to the horse and the impact that this might have on their behaviour. In some cases this may result in misinterpretation and blaming the horse for failing to behave as desired. The more we know about the horse’s perspective, the easier the partnership between horse and human becomes.

How has your late entry to research affected your academic career?

To date, I believe that it has been an advantage. Indeed, my previous hands on experience with horses – as well as the fact I have been involved in teaching horse management, riding and horse behaviour – is highly beneficial to my research. Additionally, I have received fantastic support from colleagues who are also inspired to find out more about horses, as well as from our students who are generally vocationally motivated. However, progress within an academic framework requires time to conduct research, publish findings and disseminate these to the wider community – and fitting this alongside my ‘day job’ can be challenging. Moreover, this area of research tends to be poorly funded and so it is not progressing as fast as it should. It is my strong belief that in a high-risk sport such as riding it is important to do as much as we can to reduce risks to both horse and rider. I am confident that the findings from my research will contribute to this aim.

In what ways have other colleagues or collaborators inspired or aided your work?

Many of my colleagues are involved in equestrian sport in one way or another and discussions with them ensure that my research is addressing issues that matter to the end user. In addition, my association with the International Society for Equitation Science has been a valuable source of inspiration and support. It has been hugely beneficial to have national and international collaborators in this area. We may have different approaches but we have a common aim – to improve the ‘lot’ of the ridden, and driven, horse. I have also maintained my links with psychology and, more recently, my rider-gaze-behaviour work has been bolstered by support from colleagues in both the psychology and sports science fields.

**Horse-human harmony**

In an attempt to improve the behaviour and wellbeing of ridden horses, researchers at the School of Animal, Rural and Environmental Sciences, Nottingham Trent University, UK, are conducting insightful research into the vision of both horse and rider.

**ROOTED IN THOUSANDS** of years of history, the longstanding relationship between horses and humans is deeply rewarding and mutually beneficial. Indeed, people derive great pleasure from horses, and riding is one of the most popular sports in the UK. Unfortunately, indiscriminate breeding and the development of equine behavioural problems have resulted in high levels of wastage among horses. Sadly, the vast majority of these stems from human activity, often as a result of poor signals that transmit unclear messages to the horse or unknowingly reward undesirable behaviour. In order to get the most out of these animals and optimise the horse-human partnership, it is essential to develop a more complete understanding of how the horse perceives the world and to fully appreciate the impact of human behaviour.

Motivated by a desire to improve the ‘lot’ of the often misunderstood horse, Dr Carol Hall has devoted the past couple of decades to exploring how horses perceive the world. As a lifelong lover of horses and the current Research Coordinator / Reader in Equitation Science at the School of Animal, Rural and Environmental Sciences at Nottingham Trent University, she is passionate about creating a more horse friendly approach to riding and training. By investigating the impact of human requirements and behaviour, Hall’s research is laying the foundations for improved training methods that do not place unfair demands on the horse. To date, her studies have made fascinating insights into the welfare of ridden animals, as well as the visual ability of horses and the visual behaviour of equestrian athletes.

**A VISIONARY APPROACH**

Hall’s research began with an investigation into equine colour vision. As an under-researched phenomenon that had previously thrown up contradictory results, she was intrigued as to why so little was known about what colours horses see. “Initially, it was my aim to revisit previous colour vision studies as I was not convinced by the results,” she explains. “There was a suggestion that horses could not tell the difference between yellow and white but, since my horse would ignore white road markings and freeze at yellow ones, I thought this highly unlikely.” In order to assess the behavioural responses of horses to different colours, Hall analysed the hesitancy of horses to cross different coloured flooring and conducted choice tests to determine which colours horses would more readily approach. Based on methods used by Professor Karl von Frisch – a Nobel Laureate who tested wavelength discrimination in bees – she studied the extent to which horses are able to discriminate 15 different colours.
from varying shades of grey. The results demonstrated that all colours presented to the horses were seen as colourful to a greater or lesser extent, with yellow and blue identified as the most distinguishable colours.

Hall’s foundational research on colour vision has significant implications for understanding the world from the horse’s perspective. While the equine environment is currently designed with human vision in mind, horses may in fact perform better in different conditions, such as in dimmer lighting than is optimum for human sight. Additionally, key environmental features, such as jumps of certain colours and designs, could look very different to horses and humans. “Although no direct correlation between the visual features of cross-country fences and the increase in rotational falls (and subsequent injuries and fatalities) has been found,” elaborates Hall. “The differences in visibility for the horse and human may be a contributing factor to the occurrence of these falls.”

GAUGING THE GAZE
It was these differences in visual perception between horse and rider that led Hall to embark on a project that analysed the gaze behaviour of horse riders approaching a jump. While eye tracking in humans has been implemented in a number of other sports in order to identify elite visual skills, limited and cumbersome technology had previously hindered these tests in horse riding. To address these issues, Hall and her colleagues used a mobile eye-tracking device (ASL Mobile Eye) to establish the timing, frequency and duration of rider eye fixations on the jump and the percentage of time during which their point of gaze was located elsewhere. Interestingly, while no statistically significant correlations between gaze behaviour and skill scores were identified, they found that the more skilled riders tended to fix their gaze on the jump earlier and for a longer duration. Moving forwards, the researchers are planning to use their initial data on rider gaze behaviour to determine the key features of equestrian visual skills and ascertain what differentiates elite from non-elite performers. To this end, they are currently planning to implement trials with elite riders and identify how sport-specific visual skills relate to performance. Indeed, visual training could prove to be excellent preparation for participation in equestrian sport with significant benefits for both the horse and rider. By continuing to chart the information they learn about horse vision and comparing it with human vision, Hall and her colleagues hope that their research findings could be used to develop more horse-friendly obstacles and improved training techniques for riders, thus reducing the occurrence of accidents in show jumping and cross-country.

By investigating the impact of human requirements and behaviour, Hall’s research is laying the foundation for better and more informed training methods that do not place unfair demands on the horse.

TOWARDS A HARMONIOUS FUTURE
Looking ahead, Hall is eager to continue forging deeper insights into how the sensory systems of horses shape their perception of the world around them. Although it is impossible to fully experience life from a horse’s point of view, her studies are helping to answer complex questions about the processes that underpin horse behaviour. “Having spent eight years trying – and largely succeeding – to find out at about the colour vision of horses, I am well able to appreciate that perceiving the world through the eyes of another individual, let alone another species, is far from being a simple task,” she affirms. “Despite this, for those of us who ride and interact with these amazing animals, I believe there is an ethical imperative to try and look at things from their point of view and work towards improving the quality of their lives.”