A different view on seeing red

Our ability to interpret a blush – or blusher – results from subtle evolutionary development, says Stephen Pincock

New York fashionistas have fallen head over heels this season for a teenage model by the name of Gemma Ward, a blonde waif whose blushing complexion and pink lips make her perfect for the latest make-up styles.

Or at least, that's what I read in The New York Times last week. Ward's face, the paper reports, has inspired a trend for "flushed cheeks, pale eyelids and rosy, bee-stung lips".

I mention all of this not because I've unexpectedly been promoted to the post of FT beauty columnist but in light of a fascinating research paper published this month that makes some suggestions about why we're so sensitive to the colour of Gemma's cheeks in the first place.

As we all know, changes in the redness of our faces are key signals of our emotional state. When we blush, flush or blanch, we reveal the fact that we're feeling embarrassed, aroused or shocked. Similar things happen to our cousins the chimps, although their indication of sexual readiness is signalled by a red rump rather than pink cheeks.

In the *Proceedings of the Royal Society*, Mark Changizi, a neurobiologist from the California Institute of Technology in Pasadena, contemplates this phenomenon in the light of evolution.

Given that humans (and chimps) are so highly social, he says, there must be huge benefits in being able to identify the emotional and sexual state of those around us. In other words, he suggests that perhaps our colour vision evolved the way it did to make us good at identifying things such as rosy cheeks and bee-stung lips.

If this hypothesis was true, Changizi thought, then the colour receptors in the back of our eyes should be really terrific at detecting precisely the kinds of changes that take place when oxygen-rich blood rushes to our cheeks.

The place to look for this evidence is in the parts of our eyes known as cone cells. Most people have three varieties of these, each of which is tuned to different wavelengths of light – short, medium and long, also referred to as blue, green and red. As it turns out, Changizi reports, the medium and long cones in our eyes are not just OK at detecting shifts in skin colour due to blood flow, they are excellent. The optimal sensitivity of those cones lies at almost exactly the right wavelengths for detecting blushing cheeks and ruby-red rumps.

Another prediction of Changizi's hypothesis is that the ability accurately to detect changes in skin colour will have tended to evolve in animals with bare skin on their faces. After all, being able to see a rush of blood is no use if it is masked by a thatch of dark fur. This also turns out to be true. Primates with three types of cone tend to have bare faces and, in some cases, bare rumps. Other species, with only two cone types, don't.

Hot flush: Gemma Ward Catwalking.com

All of this is particularly interesting when you compare human and primate colour vision to that of other animals. While some other species have more varieties of cone cells than us – birds, fish and bees have four or five varieties and some can see in ultraviolet – their systems don't show the same sort of specialisations.

"For birds, fish, and also bees, their cone maximal sensitivities are uniformly spread over the spectrum, kind of like one might expect if one were to be the engineer designing a colour vision system," Changizi says. "But for primates there is one short wavelength cone and then two long-wavelength cones [medium and long] that are nearly side-by-side!" His blush-detection theory explains why this should be.

What it all boils down to is this: when the lovely Gemma daubs a spot of blusher on the upper slopes of her cheekbones, thereby mimicking a state of arousal, she's not just marketing high-cost cosmetics. She's actually playing a very sophisticated game based upon the evolution of the mammalian visual system.

What's more, it seems pretty clear that she's playing to an appreciative audience, because recent research suggests women are actually a couple of steps ahead of men in the colour vision stakes.

The first advantage they have is well known. Because the genes for the medium and long wavelength colour receptors live on the X chromosome – of which women have two and men just one – men are left vulnerable to colour-blindness.

The second benefit is more interesting. It emerged only a couple of years ago when US researchers Brian Verrelli and Sarah Tishkoff examined the genetics of the colour-receptor genes.

They found that the gene for the red cone is surprisingly variable. This means that for some women, their two different copies of the gene might be two slightly different variants.

This variation means that some women could, in effect, have four different types of colour-detecting cones in their eyes, and therefore be able to perceive a broader spectrum of colours in the red/orange range than men.

Whether this means that women are also better able to read people's moods based on changes in their face tone isn't clear but it might go a long way to explaining why the pink of Gemma Ward's cheeks has generated such excitement.

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Genetic make-up

By Stephen Pincock
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