

A Close Look At Hair

Hair is an important evolutionary adaptation that sets mammals apart from others in the animal kingdom. Under the power of the electron microscope, not all hair is the same.

What is hair? Put simply, it is the long stuff that sprouts from various places over our bodies and the stuff that we spend an inordinate amount of time cutting, cleaning, colouring and combing. But scientists view hair as keratinised filamentous outgrowths, and an important evolutionary adaptation that is exclusive to just one group of animals - mammalia.

Hair comes in an extraordinarily wide range of types. Comb the hair on your head, put on a woolly hat

or stroke a dog's back and it is apparent how different these textures feel. Yet they are all made of the same thing - mammal hair.

When you observe these hair types with the power of the scanning electron microscope, the differences become more apparent. Mammal hair is basically a polymer of long chain molecules of proteins called keratins. Each strand of hair consists of three parts: an inner sheath known as the medulla; a middle section known as the cortex; and an





outer sheath known as the cuticle. The cuticle determines the mechanical strength of hair and is made of scaly layers. In humans, there are up to eight scaly layers, but in sheep's wool there is only one. The cortex and medulla are often pigmented to give the animal's hair a distinct colour. Hair often varies in cross-section too. For example, the hair of a Caucasian human is circular, but that of the rabbit is wavy. There are also

hair types that are oval and even flat.

To zoologists and forensic scientists observing through a microscope, this combination of cuticle scale pattern, cross-sectional shape and hair colour give a good indication as to what type of animal the hair belongs to.

Mammal fur is often a mixture of several different types of hair. The longer, visible hairs on the coat of most mammals are guard hairs.

Guard hairs cover thinner, shorter hair known as underfur. In some species, they are modified to form spines like those of the hedgehog.

The guard hairs of the polar bear are well oiled to protect against the wet - but when viewed under the scanning electron microscope, the structure also reveals a hollow core. The space in the hollow fibre is filled with air, which acts as a very good insulator for the animal in the extreme cold of the Arctic.

Hair is more than just a coat of insulation against the elements. It also serves a variety of other functions. Take the whiskers of a cat: long, straight and stiff, these specialised hairs are connected to a root rich with nerves, making them sensitive to touch. And desert animals like the camel have short, dense hair that reflects heat and the intense UV radiation of the Sun.

Man is called 'the naked ape'



because of the distinct lack of dense body hair. Although there are many theories about the reasons, there is one indisputable link to our hairy ancestors - the fine downy hair that covers most human embryos in the mother's womb. In babies, this downy hair, or lanugo as it is known, usually disappears before or just after birth.

Without hair, animals would suffer from the cold and the heat. Many species would also lack the protection afforded by spines,

camouflage or waterproof oily fur. The world would also be a less colourful place if red squirrels or foxes did not have their brightly tinted fur. It is clear that the evolution of hair is one of the key attributes that have helped mammals adapt to almost every habitat on Earth.

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