Scientists set out to measure how we perceive naturalness

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Natural products are highly valued by consumers yet their properties have been difficult to reproduce fully in synthetic materials, placing a drain on our limited natural resources. Until now ...

Scientists at the National Physical Laboratory (NPL) are working towards producing the world's first model that will predict how we perceive naturalness. The results could help make synthetic products so good that they are interpreted by our senses as being fully equivalent to the 'real thing', but with the benefits of reduced environmental impact and increased durability.

NPL began undertaking a real-time experiment at the Royal Society's Summer Science Exhibition. The public were invited to touch and feel 20 wood and wood effect samples and vote on whether they are real or not. The exhibition will now be toured around the UK during the next year to collect a census of data from across the country. This will then be used to help build the first predictive model of how we judge naturalness.

As well as the real-time experiment the travelling exhibition will include a range of interactive exhibits that explore the perceptual process. The first of these will show how we can use body parts to measure an object, as the ancient Egyptians did with the cubit, a standard measure related to the Pharaoh's arm length. There are visual, tactile and auditory experiments designed to demonstrate the limitations of the senses as measurement devices, by exposing how perceptions can be fooled by

illusions. Videos will highlight the how the use of Magnetic Resonance Imaging (MRI) brain scans is helping us understand the perceptual process, by allowing researchers to discover which areas of the brain are stimulated when people carry out specific tasks, such as using their vision and touch senses to explore natural and non natural wood samples.

The exhibit is part of a much larger EU-funded project undertaken by a unique set of multidisciplinary of researchers called the Measurement of Naturalness (MONAT). This is one of a series of EU projects trying to 'Measure the Impossible', other projects are investigating subjects as diverse as eyewitness memory, emotional response to computer games, measuring body language and understanding how music induced emotions are processed in the brain.

The MONAT team will work over three years to examine how the perceived naturalness of materials is influenced by their physical properties. It includes:

-- Neuroscientists who scan the brain activity of individuals as they examine different materials
Psychologists who measure the way people perceive different materials when they use their hands or eyes, or both

-- NPL's experts in metrology, data analysis and software modeling, who contribute expertise in making accurate physical measurements of the properties of different materials and will build the model of perceived naturalness.

The physical characteristics of a surface, such as its colour, texture and surface roughness, are being linked to what is happening in a person's brain when they see or touch the surface. Once this is understood it should be possible to accurately predict what we will perceive as natural, and manufacturers will be able to design synthetic products to meet this

expectation. The results could have a great impact on materials such as wood, animal skin and furs, marble and stone, plants and even prosthetics.

Ruth Montgomery of the National Physical Laboratory, said: "Our senses combine to identify natural materials. But what are the key factors, is it colour, gloss, smoothness, temperature? This is what our research is trying to establish. The focus of the research is wood, fabric and stone, but once the data is combined the aim is to produce a predictive computer model that will work for other materials. If successful the range of applications would be huge. For instance, synthetic mahogany furniture that is indistinguishable from the natural material, but won't rot or be attacked by woodworm or artificial grass so good that they use it on Wimbledon's Centre Court."

Source: National Physical Laboratory