

on

HOW WE LOOK



WIN FILM KIT:  
Prizes for beauty  
product videos  
in our Image  
Lab activity.  
See page 13.

INSTANT MESSAGING:  
Several signals are being  
sent by this Samoan man.  
*Charles Sykes/Rex Features*



## Are you looking at me? Friend or foe? Artist or exhibitionist?

When we see people, we recognise individuals, we make judgements about them, we draw conclusions about their age, their sex, their personality, their mood and their intentions.

And, deliberately or not, we send signals to others – through our expressions, the way we dress, the way we modify our bodies.

Underlying this **social communication** are the genetic and physiological processes that turn a single cell – a fertilised egg – into a three-dimensional adult.

This issue of *Big Picture* looks at this remarkable interplay – between the **biology** that sculpts our form and the **culture** that interprets, embellishes and adapts this form. It asks what we mean by normal, what beauty is and how such concepts influence the way we live. It looks at why we take the form we do, and why we do so much to change what nature has given us.

And it considers what we might look like in the future – thanks to biology or to our own powers to reinvent ourselves.

FIND OUT MORE →

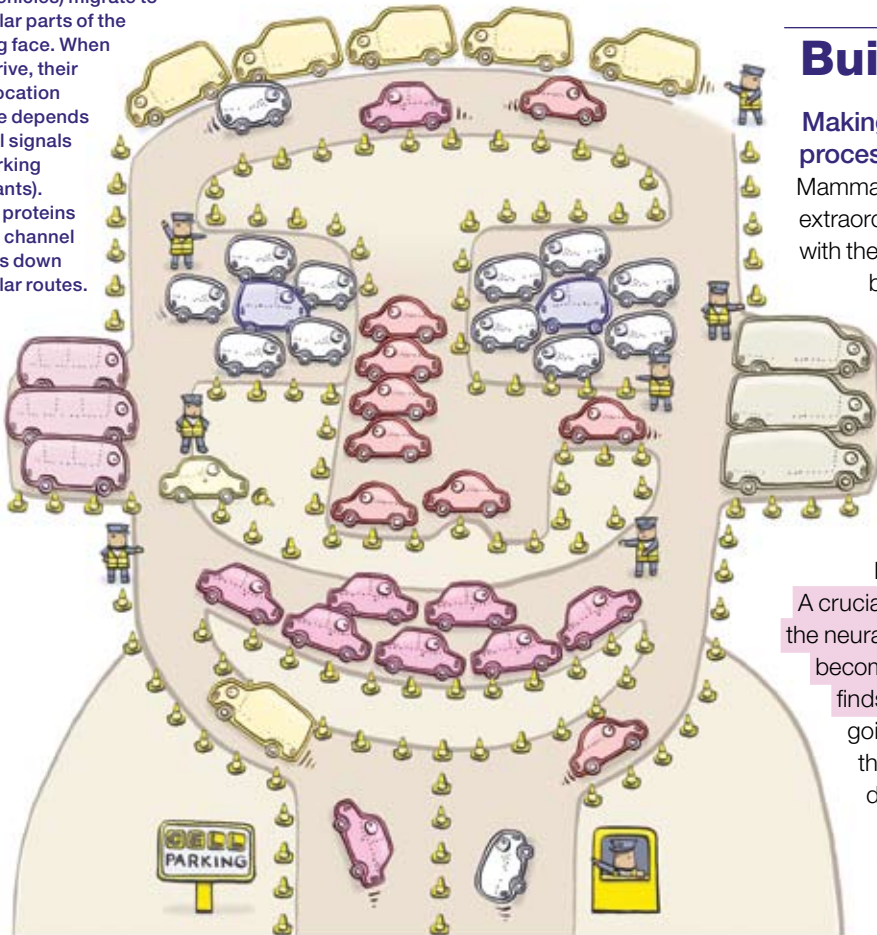
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# FACE THE FACTS

The face accommodates our main sensory organs – eyes, ears, nose, mouth. Yet the human face is not just a scaffold for these organs. It has come to take on a role of its own, supporting social communication between individuals.

## PULLING FACES:

During head development, cells (vehicles) migrate to particular parts of the growing face. When they arrive, their exact location and fate depends on local signals (the parking attendants). Marker proteins (cones) channel the cells down particular routes.



The face is a key part of our individual identity. We lavish attention on our own faces and scour the faces of others for pointers to their mood and personality.

## Building a face

**Making a face depends on a remarkably complex process of cell migration and differentiation.**

Mammalian development must be one of nature's most extraordinary processes. Early on, the embryo is tube-like with the beginnings of the spinal cord running along its back – the **neural tube**. At the front end of the neural tube (the **neural crest**), a population of stem cells multiply and swarm off in huge numbers to distinct locations, forming almost all of the skeletal, muscular and neural tissues of the head.

The human head is thus precisely sculpted by the mass **migration**, **multiplication** and **differentiation** of cells.

How is such precision achieved?

A crucial point is whether an individual cell leaving the neural crest already 'knows' what it is destined to become, or whether its fate depends on where it finally finds itself. So migrant workers might know they are going to Australia, say, but do they already know they will be teachers when they leave, or will they decide what to do when they arrive?

The answer is probably a bit of both: a departing cell is already committed to some extent but still receives crucial input from the cells it encounters in its final location. (See Big Picture Online for more.)

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## RECOGNITION AND RESPONSE



**Over time, we become adept at distinguishing face types we see regularly and less good at deciphering faces of other ethnic groups.**

There is a foundation to the white European cliché that people from the Far East 'all look the same to me' – but Chinese people will find it just as difficult to tell Caucasians apart.

This '**perceptual narrowing**' starts early in life – at three months infants show no discrimination but by nine months they recognise faces only of their own ethnic group. So a face-recognition system may be built into the brain (**hard-wired**), but learning hones its function as we grow.

In adults, unfamiliar 'other-group' faces lead to stronger 'fear-conditioning' responses in the brain. What's more, this appears to be an automated (subconscious) response. This may be an ancient defence mechanism – strangers are a potential source of danger.

So is interethnic mistrust an inevitable consequence of our brain's survival instincts?

Behaviour is rarely cast in stone and learning can influence these responses – experience of inter-racial dating, for example, lowered the fear-conditioning response. There are also plenty of examples from psychology that **priming** – what we have been exposed to in the past – exerts a big influence on our behaviour, even if we are not aware of it.

Understanding some of the factors that influence our behaviour can help us to overcome innate constraints or prejudices, for socially desirable ends. And they can help us appreciate why, for example, racial stereotyping is so damaging.

## Read my face



Expressions are created by the action of specific muscles in the face. These were tested by the French doctor Duchenne de Boulogne, who in the 19th century used electric currents to stimulate muscles and re-create particular expressions (top). Similar approaches have also been taken by artists (bottom).

The Varieties of Human Facial Expression, 12-bit version by Arthur Elsenaar and Remko Scha, videography by Josephine Jasperse

The face is supposedly the window into the soul. Certainly, it can provide a way to assess someone's internal state.

There are seven universally recognised emotions shown through facial expressions: fear, anger, surprise, contempt, disgust, happiness and sadness. This universality was noted by **Charles Darwin**, among others.

Expressions depend on the characteristic arrangement of facial features, which can be 'read' by observers, though some are easier to identify than others (surprise and fear are often hard to tell apart). Face-reading skills appear very early. Even seven-month-old infants pay more attention to fearful faces.

In fact, **fear** appears to be a very powerful expression. We recognise fear in someone's face even before we have identified who that person is, and even subconscious detection of fearful faces can profoundly influence our behaviour, much more so than subconscious detection of other emotions. Fear processing is associated with activity in the **amygdala**, a key structure in the 'emotional brain'.

The importance of facial expressions reflects the importance of social communication to humans. Our success as a species has depended on our ability to cooperate and act together. A key aspect of our cognitive powers is our ability to judge what others are thinking and hence how they might act.



**MAN OR ICON?** An Italian woman with dementia had lost her ability to recognise even close members of her family. Yet she was consistently able to recognise the Italian politician Silvio Berlusconi. One possibility is that Berlusconi had been 'recategorised' in the woman's brain, as an 'icon' rather than an individual, and the processing underlying recognition was taking place in a different, intact area of the brain.

Sipa Press/Rex Features

## Who are you?

Some people are less able to identify or interpret facial expressions.

People with an **autistic spectrum condition** are less able to read expressions, part of a deficit in **theory of mind** – understanding what others are thinking. In neuropsychiatric disorders such as **schizophrenia**, individuals may see bystanders as more threatening than they really are. Similarly, people with **social phobia** tend to interpret neutral expressions as negative.

There have also been suggestions that people prone to **antisocial behaviour**, particularly violence against others, are less able to identify or react appropriately to negative emotions in faces. In most people, exposure to an expression of fear or unhappiness will trigger feelings of pity; someone with **psychopathy**, though, may simply not recognise the negative emotion and their behaviour will not be influenced to the same degree. This may even be true of younger people (or unsympathetic bosses) who show callous or cruel behaviour.



Paul Ekman

PHOTOS TAKEN IN NEW GUINEA IN 1967, ON A TRIP TO TEST DARWIN'S IDEA THAT FACIAL EMOTIONS WERE UNIVERSAL. The man, of the island's Fore people, was asked to show how he would look if he (from left) learned that his child had died, met friends for the first time that day, saw a dead pig in the road, or was about to fight with someone.

Young children are not good at picking up subtle social cues from faces. They improve during school years, with a small drop during adolescence as the brain undergoes major rewiring. There are hints that girls are better at recognition (and social skills more generally) than boys, but sex differences are relatively small.

Damage to the brain – due to injury or conditions such as Huntington's disease – can also affect recognition. The ability also seems to decline with age. So one reason why some patients or elderly people might become more difficult is because they are less able to recognise how others are feeling.

## Faces on the brain

The brain has specific areas devoted to the face.

When we see a face we can judge almost immediately sex, age and ethnic origins, and tell to some extent what someone is thinking and what he or she is like. We can tell if it is someone we have seen before, even if they have aged, changed hairstyle or are wearing new glasses.

This ability depends mainly on specific face-recognition systems in the brain.

A dramatic illustration of this specificity comes from people who cannot recognise faces, a condition known as **prosopagnosia**. The term was coined by a German physician in World War II who studied patients with brain damage, including a soldier with a bullet wound who could not recognise the faces of his friends and family, or even his own face, but relied on clothing or other cues.

People with prosopagnosia can see perfectly well and could describe or draw someone as well as anyone else, but cannot identify someone as a particular individual.

Peter Thompson



The 'Thatcher Effect' (so-called because it was first shown using pictures of the former Prime Minister) illustrates how the brain treats faces as 'special'. Manipulation of an upside-down face is much less noticeable than the same change made to a correctly oriented face.

It is generally associated with brain damage, though there is some evidence of **inherited forms**. It is also possible that milder forms are more common than once thought – perhaps explaining why some people have trouble tracking particular characters in films.

# BODYTALK

**FAST FACT**  
**6'1"**

The average adult male height in The Netherlands, making Dutch men the world's tallest.

Our bodies come in all shapes and sizes. We can thank forces as diverse as our evolutionary history, our genes, our upbringing and our environment for our body shape. Increasingly, in modern society these factors are combining to drive up our weight.

How, though, do we come to know where our body ends and the outside world begins? How can we manage to move parts of it so precisely? What is going on when we don't feel well 'in ourselves'? The brain is constantly acquiring information from the body, creating a mental representation of the body and its state of health.

Andres Peiro Palmeri/Stockphoto



**GRUMPY:** Does the way we stand or walk say anything about us? Slumped shoulders signal unhappiness – 'heads go down' when things are not going well on the games pitch. Body language is also alive and well in the animal world, where signs of submission are signalled through particular body postures.

Leslie Banks/Stockphoto



**BEEFY:** Belgian Blue cattle and Texel sheep breeds are both highly muscular, due to mutations affecting myostatin. 'Callipyge' sheep also have well-developed muscles, particularly around their hindquarters – their name translates as 'beautiful buttocks'.

## Human shape

### What decides our physical form?

Our 'natural' size is governed by several factors, including our genetic make-up. We are beginning to find out about some of these genes (see page 6).

A crucial phase in our development is our time in the womb. Our mother's diet and health will impact on our birthweight. With food relatively plentiful (in developed countries), small babies tend to go through 'catch-up' growth in infancy. Although this may have benefits when young, it appears to store up problems in later life – increasing the risk of cardiovascular and other metabolic diseases – as small babies may be born 'preprogrammed' for a life of low nutrition.

Growth of the fetus also depends on an interplay between the genes inherited from the mother and those from the father – the paternal genes acting to increase fetus size, the mother's trying to limit fetal growth (see *Big Picture on Sex and Gender*).

### Taller, bigger, fatter?

In most developed countries, people have been getting taller. For the past couple of hundred years, improvements in nutrition have led average height to increase significantly. Now, rather than getting taller, we just seem to be getting fatter. Arguably, limited nutrition restricted our potential growth in the past. Once that potential had been reached, additional nutrition doesn't make us taller; it is stored as fat.

Fat is deposited in various places around the body, and in slightly different ways in men and women. Overweight people are sometimes divided into 'apple-shaped' and 'pear-shaped', depending on where fat is predominantly deposited – around the abdomen or the buttocks and thighs. Being an apple shape is a greater health risk than being a pear – an illustration that the links between weight and health are not always straightforward. It also illustrates that measures of obesity, such as body mass index, need to be interpreted carefully.



Peeter Vlismaa/Stockphoto

## A moving story

Bipedalism, walking on two feet, is one of the defining features of humans. The last common ancestor of chimpanzees and humans probably had a quadrupedal gait, walking on its knuckles as chimpanzees do now. Walking upright would have had advantages, as it is more energy-efficient and would have permitted foraging farther afield. It has its disadvantages, though, particularly in the strains it imposes on the backbone, which may be why back complaints are now so common.

Bipedalism also calls for good balance and coordination. Some forms of brain damage can lead to difficulties with locomotion (ataxia). This is

a symptom of some inherited conditions and can result from infections such as malaria.

A Turkish researcher has recently described an extended family that walks on all fours in a 'bear crawl'.

Controversially, he has suggested that people with 'Unertan syndrome' illustrate a step backwards in evolution towards a more primitive gait. The more accepted view is that family members have difficulty balancing on two legs and tend to stand rather than crawl when infants. Unlike our presumed ancestor, family members do not use their knuckles to walk on.

Sergio Pérez/Flickr



**HAREM SCARE'EM?** *Paranthropus robustus*, which lived around 2 million years ago, showed greater sexual dimorphism than modern humans. Males were around 20 per cent bigger than females. Levels of sexual dimorphism seem to depend on how much males contribute to child rearing. See Big Picture Online for more.

# Muscles and skeleton

From Van Hul W et al. *Am J Hum Genet* 1998;2:391-9. © 1998 American Society of Human Genetics, published by Elsevier Inc.



## Our physical form is governed principally by our skeleton and musculature.

Both are constructed according to the plans laid out in our genes. Mutations can affect skeletal development by altering the balance of bone production and recycling. Mutations affecting the *SOST* gene, for example, eliminate a negative regulator of bone growth known as **sclerostin**, leading to excessive bone growth (sclerosteosis). This is seen in various disorders, including van Buchem disease (left).

Similarly, mutation of muscle proteins can affect muscle form – as in the various types

of **muscular dystrophy**. The regulator of muscle mass is a protein known as **myostatin**. Human mutations in myostatin are very rare – though a German boy has inherited mutant myostatin alleles from both his parents, and has very highly developed musculature.

There is plenty of scope for environmental input, though, particularly **nutrition**. The bow legs of **rickets** used to be a common sight in the UK, and there are fears that it may return if children are not exposed to enough sunlight to manufacture vitamin D or babies do not get sufficient from their mother. The risks are highest for some ethnic minority populations, as dark skin blocks the sun's action and clothes covering more of the skin worn for cultural or religious reasons may also limit exposure to sunlight.

**Exercise** can help to strengthen both bones and muscle. Impact exercise can increase bone density and protect against osteoporosis in later life. As any body-builder knows, regular weight training can enhance muscle physique. However, even here genes exert an influence – several genetic variants have been found to influence the effects of resistance exercise.

# Jumping to conclusions

Eric Simard/Stockphoto



Nikolay Mamlukev/Stockphoto



/Stockphoto



## Stereotyping is a short-term strategy that often causes long-term problems.

It is well known that all scientists are grey-haired men in white coats and glasses. At least, that is what many children typically draw when asked to describe a scientist. It's a stereotype and one that is proving hard to shift.

Stereotypes are useful because they enable us to infer information very quickly. The drawbacks are that they may be inaccurate and are indiscriminate – everyone gets the same label. So our assumptions about an individual may be quite misleading. Stereotypes are also a sure-fire route to prejudice and discrimination.

Traditionally, we have grouped people by physical appearance and attributed collective characteristics to them. The notion of races emerged this way. Historically, racial stereotyping has been one of the most damaging forms of prejudice. Attitudes shaped by stereotyping are often a result of unfamiliarity: there is good evidence that negative feelings about other races are tempered by greater exposure to individuals from those races.

# Inside story



Anthea Stevking



Anthea Stevking

## How do we know where our body begins and ends?

We are remarkably good at working out where the various bits of our bodies are and moving them to where we want them to be.

This allows us to walk, talk, write, type and play tennis. Fortunately, this information is generally obtained automatically – we don't need to see or touch our leg to know where it is.

This monitoring is carried out by a network of **proprioceptors**, sensory neurons in tissues such as muscle, tendon and ligament. These send messages to the **cerebellum**, which achieves the awesome task of integrating information to manage our posture. It also relays signals to the motor system in the **cortex**, feeding into control of movement.

A slightly different (and less well understood) concept is that of **interoception** – detection of internal states. This includes input from stretch receptors associated with organs such as the gut, but extends beyond that to a sense of how we 'feel' internally. This includes aspects of subjective states such as hunger, thirst, pain and similar sensations. There is a strong emotional component to these sensations – and, conversely, strong emotions can trigger sensations that suggest internal physical changes ('my heart was in my mouth'; 'I was sick to the pit of my stomach').

The interoceptive system is centred on a region of the brain known as the **insula**, and has been proposed to be responsible for producing an integrated sense of subjective 'self' (and hence may play a role in consciousness or self-awareness). Interestingly, the insula is thickened in people who meditate, a technique that emphasises concentration on internal body states.

# PHANTOM LIMBS

After Image, Alexa Wright 1997



Phantom limbs are experienced when people feel that an amputated limb is still connected to their body. Often, this is experienced as a painful sensation – but it has nothing to do with tissue damage. Surgery was sometimes used to try to eliminate the pain, but this rarely helped – and sometimes left a patient with two phantoms.

In fact, the problem seems to lie in **brain regions** that interpret the sensory information from the body surface. After amputation, these reorganise; the degree of reorganisation correlates well with the experience of pain. Remarkably, tricking the brain into thinking that the limb is present, through use of mirrors or virtual reality, seems to help reduce pain.

The above images are from a collaborative project that used digital manipulation to help patients visualise what their phantom limb felt like to them.

# GROWTH AND FORM

The basic body plan of humans – two arms, two legs, ten toes etc. – is encoded within the DNA instructions inside our cells. So how we turn out depends on the genes we inherit from our parents, but also what happens to us in the womb, and the environmental influences to which we are exposed after birth.

Scientists are gradually unravelling the extraordinarily complex developmental processes that turn a fertilised egg into an adult human. Insight comes from studies of people whose physical development differs from normal patterns and from work with 'model organisms'.

And an evolutionary perspective is shedding light on the millions of years of changes that have led to the current human form.

## Genes and body plans

The answer lies partly in genetic changes affecting proteins, but also in the sophisticated way genes are switched on and off. The fate of a cell – whether it turns into a neuron, or a kidney cell, or a white blood cell – depends on the set of genes active within it. By exquisite control of when and where genes are active, cells are made when and where they should be, and collectively form tissues, organs and ultimately an entire body.

So how is this control exercised? Several mechanisms are known to be crucial.

**Regulatory genes:** Some genes have very powerful effects, because they regulate other genes. One protein may activate tens or hundreds of genes, and thereby switch on an entire developmental programme.

A classic example is the fruit-fly *Antennapedia* gene, which can turn a leg into an antenna (or vice versa).

**Organising centres:** Cells can exert a profound influence on their neighbours. Transplant the right bit of a tadpole, for example, and it will stimulate the growth of a new leg.

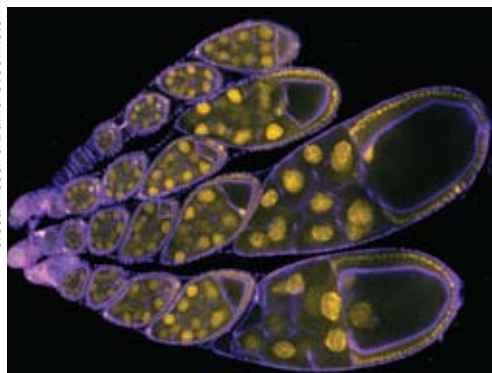
Such organising cells secrete (or have on their surface) molecules that switch on (or off) genes in cells around them.

**Morphogen gradients:** Some cells release signalling molecules that control tissue growth (**morphogens**). The concentrations of morphogens will be high next to the cell releasing it but will fall away with distance – creating a morphogen gradient. If cells respond differently to different concentrations, one morphogen can generate a range of cell types.



Ulises Sepúlveda Déniz/iStockphoto

**HEDGEHOG SHAPES DOLPHIN:** Whales and dolphins have almost entirely lost their rear limbs. By looking at the fossil record to see how limbs have changed, and analysing the activity of genes involved in limb formation in animals alive today, a US group has suggested that gradual loss of activity in a gene known as *Sonic hedgehog* led to a reduction in limb size, starting around 41 million years ago. Research combining evolution and developmental biology – 'evo-devo' – has become increasingly popular in recent years.



Teresa Niccoli & Daniel Str. Johnston

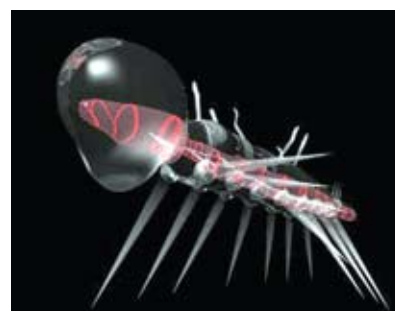
**FLY BY NIGHT:** Eggs of the fruit fly *Drosophila*, a popular choice in studies of development.

**To build something, you need instructions – for bodies, a genome.**

The genome is sometimes likened to a blueprint or a recipe book, as it contains the instructions needed to build an organism.

The assembly process is finely controlled in time and space – eyes, for example, are made only in the head and begin developing only when the head is prepared for them. As bodies are made of cells, embryo development is crucially about **cell fate** – making sure that a nose cell, say, is made only where and when it is needed.

It might seem astonishing that a four-letter DNA code can achieve such wonders. This point was reinforced when the Human Genome Project revealed that humans have just 23 000 or so genes – not the 100 000 many expected. How could so few genes build the rich complexity of a human?



Wright Center, Tufts University

## HALLUCIGENEA

This bizarre creature lived some 500 million years ago, and was first identified in the famous Burgess Shale, a fossil record of many life forms that emerged during the 'Cambrian explosion' and died out at a mass extinction event that killed off around half of all animal species on Earth. A recent reappraisal suggests that this reconstruction is actually upside down. The life forms that exist to today are the descendants of organisms that survived extinctions. The shape of life today has been moulded by what came before it – nature adapts rather than invents.

*SONIC HEDGEHOG* is a crucial gene for the development of our hands and feet (and our brains). So why does it have such a silly name? Enter the bizarre world of *Sasquatch*, *baboon* and *cheap date* at Big Picture Online...

[www.wellcome.ac.uk/bigpicture/howwelook](http://www.wellcome.ac.uk/bigpicture/howwelook)



ON THE WEB

# Developmental disorders

## One-third of all genetic disorders affect the head and face.

Occasionally, the finely choreographed pathway from egg to adult goes awry. If a mutation affects a developmentally important gene, the course of development is changed.

There are many thousands of genetic disorders that affect physical or intellectual development or both. Many give rise to distinct features, often involving the face. Specialist clinicians can often identify these conditions on the basis of a child's appearance as well as his or her developmental and behavioural features.



### Down syndrome:

One of the most common genetic disorders. It is caused by an additional copy of chromosome 21, and it has proved difficult to work out exactly which genes on this chromosome underlie which symptoms.



**Treacher Collins syndrome:** Characterised by changes to the face, sometimes extensive. Mutations disrupt bone formation during embryogenesis. People with Treacher Collins syndrome often face discrimination, as they are assumed to be of low intelligence – in fact, their cognitive abilities are not reduced.



### Williams-Buren syndrome:

Children often have heart problems and learning difficulties, but also a distinctive, engaging personality. The condition is often due to loss of several genes on chromosome 7.



### Moebius syndrome:

A form of facial paralysis that leaves people unable to move many of their facial muscles. This leaves them with a permanent 'deadpan' expression and an inability to express emotions through the face. The genetic cause of Moebius syndrome remains unclear, and some cases have environmental causes. (See Big Picture Online for more.)



### Marfan syndrome:

Caused by mutations affecting an extracellular matrix protein. Those affected tend to be very tall with long limbs; they commonly have eye and heart problems.

## FREAK SHOW

The 19th century was the golden age of the 'freak show', where people with unusual physical forms – such as conjoined twins, giants and dwarves, or people who had hypertrichosis (excess face and body hair) and ichthyosis (elephant-like skin) – were displayed in the name of entertainment.

Most popular in the USA, and run by entrepreneurs such as P T Barnum, freak shows survived into the early decades of the 20th century, despite a growing outcry that they insulted the dignity of the people on display.

Later, though, some people have seen their abnormalities as a route to economic survival, developing their own acts or joining circuses. Examples include Otis Jordan (Frog Boy), Grady Stiles (Lobster Boy) and Frank Lentini, the three-legged man. Others have used their unusual appearance in an artistic context or to challenge viewers.

While most of us find the idea of freak shows distasteful, the popularity of documentaries such as *The Boy Whose Skin Fell Off* is testimony to our continued fascination with 'otherness'. While such shows, at their best, emphasise the common humanity of people born 'different', it is a thin line between informative TV and the exploitation seen in former times.



**DOUBLE-ACT:** Chang and Eng, the original 'Siamese twins'. They were exhibited during the early 1800s, later going into business on their own. They married sisters and eventually had 22 children between them. They died on the same day in 1874.

## NEW GENES

A surge of discoveries has revealed insight into the genes underlying physical appearance.

### Blue eyes:

All present-day cases may derive from a single genetic change that occurred 6–10 000 years ago, during the Stone Age.



**Redhead:** People with two inactive alleles of the *melanocortin 1 receptor (MC1R)* gene have the classic 'Celtic' red hair and pale skin appearance.

### Hair:

The *EDAR* gene is associated with hair thickness in Asian populations.



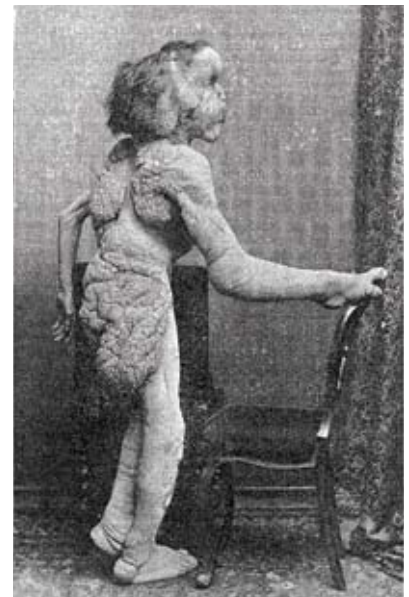
The thick-hair variant appeared after ancestral Asian and European populations split.

**Skin colour:** At least eight genes affect melanin production and hence skin colour. Light skin is probably an adaptation to life at higher latitudes.

FOR MORE on the genes controlling height, weight and skin colour (and earwax consistency) see Big Picture Online.



[www.wellcome.ac.uk/bigpicture/howwelook](http://www.wellcome.ac.uk/bigpicture/howwelook)



Joseph Merrick, the Elephant Man, made a living as a sideshow exhibit until they were outlawed in 1886. A sensitive and intelligent figure, he later became a noted society figure before his early death aged 27. It is likely that he suffered from Proteus syndrome, which causes an overgrowth of skin, bone and other tissues.

Christoph Erme/IStockphoto

Umbar Shakir/IStockphoto

# AM I NORMAL?

Humans don't differ greatly. Physical traits typically follow a normal distribution – a few people at the extremes, most in the middle.

But the middle seems to be a place of safety – those at the extremes inspire curiosity and even animosity. Even a minor difference may be picked up on and mocked. Other extremes, though, may be looked upon with admiration or envy.

So perhaps it is not surprising that our physical appearance is so important to us – sometimes harmfully so. We seek ways to adapt our appearance, to emphasise who we really are or to try to be the person we wish to be.



Jacob Wackerhausen/Stockphoto

## A quest for perfection?

### Why are we so rarely satisfied with our looks?

Surveys consistently show how unhappy most of us are with our looks. Cosmetic surgery in the UK is booming. We spend a fortune on haircuts and cosmetics. Why the obsession with our appearance?

Some argue that modern life is **looks-conscious**. Media images are dominated by the young, thin and beautiful. Fun is poked at celebrities deviating from an idealistic perfection, exposing cellulite on the beach.

This can create wholly unrealistic expectations of

what is normal or why people should be valued.

Is this a new phenomenon? Probably not. Society beauties have used attractiveness to advance themselves socially, and attempts to enhance nature's work have a

long history. Cosmetics were used way back in Ancient Greek and Roman societies. Indeed, they were sometimes seen as a branch of medicine. Physician Abu al-Qasim al-Zahrawi, or Abulcasis (936–1013

CE), wrote a 30-volume medical encyclopedia *Kitab Al-Tasrif*, which devoted a chapter to cosmetics (*Adwiyat al-Zinah* or 'medicine of beauty'). Cosmetics would have been a distinct help for those disfigured by syphilis or smallpox.

The modern era of cosmetics took off in the 1920s, thanks largely to **Hollywood**. As well as increasing people's exposure to beautiful women and well-groomed men, products designed to improve appearance

on film filtered down to the wider public. The earliest signs of culture include things like jewellery, suggesting that adornment or beautification is very deeply rooted in human behaviour. Whether it is still an advantage to us is a moot point.



**EYE LIGHTS:** A carved wooden container for kohl, from the temple of Queen Hatshepsut, who lived in Egypt around 3500 years ago.

### OLDER BUT WISER

As we get older, the ravages of time make their mark on our body. We spend huge sums trying to disguise or reverse these changes (mostly without success). Why this obsession with looking younger? Why, when once they were admired for their wisdom and resilience, are older people now more likely to be stereotyped as having lost their marbles?



Caroline Penn

[www.wellcome.ac.uk/bigpicture/howwelook](http://www.wellcome.ac.uk/bigpicture/howwelook)

ON THE WEB

## Is bigger better?



### Dwarfism is rare, but not that rare. Is it something to be treated or just part of life's rich tapestry?

Human height follows a normal distribution, typical of a trait influenced by many genes. At the extremes, though, the effects of single genes are seen, with the genetic conditions of **dwarfism** and **gigantism**.

Dwarfism applies to people with an adult height of 4'10" (147 cm) or less. There are about 200 types of dwarfism. The most common form (accounting for around 75 per cent of all cases) is **achondroplasia**, which occurs once in 10 000 to 40 000 births. People with achondroplasia have disproportionately short arms and legs, and large heads with prominent foreheads.

Achondroplasia is caused by mutations in the gene for fibroblast growth factor receptor 3 (*FGFR3*), which leads to abnormal bone development. Most cases (75–90 per cent) arise spontaneously, without any family history.

Although conditions such as achondroplasia are associated with medical complications, people with achondroplasia (see page 12) can expect to live long and fulfilling lives. While certain routine activities, such as driving or turning lights on and off, may present problems, social attitudes often present a greater barrier to normal life.

The 'otherness' of people with dwarfism has been emphasised in art and literature, and films such as *The Wizard of Oz* and *Charlie and the Chocolate Factory*, where dwarfs are portrayed as fanciful or humorous creatures.

While people with dwarfism receive treatment for medical problems associated with their condition, should they also be treated for their lack of height? Bone-lengthening treatment is painful and not without risk. Groups representing people with dwarfism tend to argue that it is not necessary.

## FAST FACT £497m

The amount spent on cosmetic surgery in the UK in 2006, the highest in Europe. The UK spends as much as the next four countries combined. Spending is predicted to hit £1.5bn in 2011.

Sipa Press/Rex Features

## Beyond his and hers



## Disorderly behaviour

### Eating disorders are on the increase. Is our obsession with appearance to blame?

In 2006/07 more than 1500 people were admitted to hospital with **anorexia** or **bulimia nervosa**. Eating disorders are becoming more common in women and men.

What's going on? Are 'size zero' models and celebrities setting impossibly high standards? Or are the stresses of growing up to blame?

Eating disorders are complex behavioural conditions and are being studied in a number of ways. Psychological studies, for example, suggest that people with eating disorders tend to overestimate their weight. In addition, being exposed to an environment that values thinness and encourages dieting appears to increase the risk of developing an eating disorder.

But eating disorders are not simply about wanting to be thinner. They may be a symptom of young people's desire to exert control over their lives. **Perfectionism** and **low self-esteem** are common in eating disorders. These tend to pre-date the eating disorder, although are also often exaggerated by it. There is some evidence that people with anorexia nervosa have obsessive-compulsive tendencies and that people with bulimia nervosa are more impulsive.

These pre-existing behavioural traits may make some children particularly vulnerable. They may reflect variation in **brain chemistry**, particularly in the dopamine pathways and serotonin system, a key factor in the regulation of mood. Hormonal changes at puberty or social stresses at adolescence may be the triggers that promote disordered eating. The fairly high **heritability** of eating disorders also suggests biological factors are at work.

**Psychological treatments** have been developed to address eating disorders. In particular, **cognitive behavioural therapy** has been shown to be effective for bulimia nervosa and binge eating disorder. However, more effective treatments are needed for people with eating disorders, especially anorexia nervosa. There is also the potential to prevent cases by reducing the environmental triggers, such as excessive focus on dieting.

### BODY HATE

Some people hate the way they look, a feeling so extreme that it dominates their thinking – leading to body dysmorphic disorder (BDD). This disorder is better treated with cognitive behavioural therapy than cosmetic surgery. But what about people whose unhappiness stems from their belief that a limb is not part of them and they want it amputated? Read about a doctor's dilemma at Big Picture Online.



[www.wellcome.ac.uk/  
bigpicture/howwelook](http://www.wellcome.ac.uk/bigpicture/howwelook)

ON THE WEB

### Sometimes biological sex does not match 'brain sex'.

Some people have an overpowering feeling, often from childhood onwards, that they have been born in a body of the wrong physical sex. They may want to change their body to fit their inner '**gender identity**'. (While sex refers to biology and anatomy, gender refers to an internal sense of being masculine or feminine.)

The mismatch between biological sex and gender identity can create deep unhappiness, anxiety and psychological pain (**gender dysphoria**). As a result, mental health problems are common among untreated transgender people.

The answer, for many (although by no means all) transgender people, is to change their physical sex through surgery and/or hormone replacement therapy – sex reassignment therapy/surgery. Other transsexuals choose to live in their gender role and dress and act as the man or woman they wish to be.

Although surgery and hormone treatment are accepted medical interventions, individuals undergo a period of counselling before treatment starts.

The origins of transsexuality are unclear, but it may have a biological

basis. For example, a region of the brain known as the bed nucleus of the stria terminalis differs in size in men and women. A study of male-to-female transsexuals found that the numbers of neurons in this region were typical of females.

### A third way?

Some people argue that the West's rigid two-gender system – which insists that every individual be categorised as either a man or a woman – fails to take account of a wider spectrum of gender identities.

There are societies that include multiple gender categories, such as the so-called two-spirit people in native American tribes. On the Indian subcontinent, an estimated 5–6 million people are classified as *hijra* or 'eunuchs' (although they have rarely undergone genital surgery). *Hijra* are usually biologically male or intersex and dress as females but do not see themselves as male or female. Indian passports now include three categories – male, female and eunuch.

In some Polynesian societies, *fa'afafine* are likewise considered to be a 'third gender'. They are biologically male, but dress and behave in a manner considered typically female. *Kathoey*s ('ladyboys') of Thailand fall into a similar category.

## TATTOO ME

The modern era of **tattooing** arose from **James Cook's** 18th-century voyages to the Pacific – hence its popular association with sailors. Surprisingly, it also caught on with royalty and the social elite (Queen Victoria was rumoured to have a tattoo in an 'intimate location'). Only later did it become associated with rebellion and counter-culture. Its popularity has increased recently, following its adoption by celebrities such as David Beckham.



QUEEN VIC: Royalty were once big fans of tattooing.

# BEAUTY SPOT

## FAST FACT

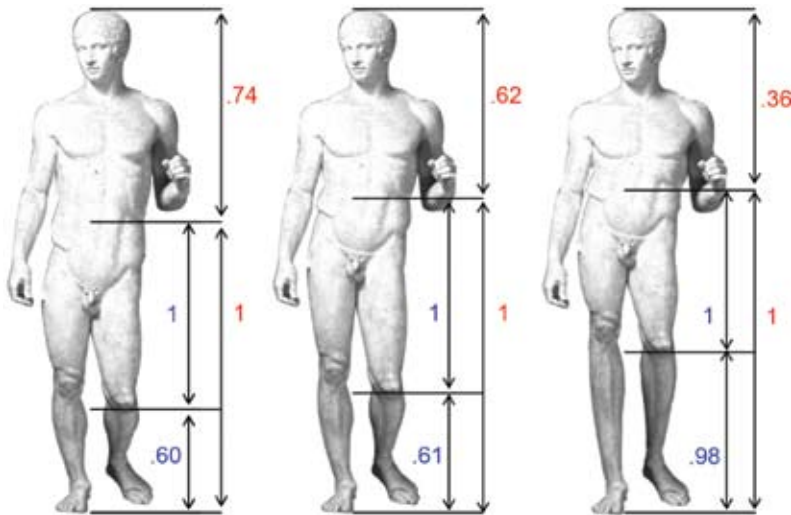
A study of women of the Sahrawi culture in Morocco found that more than 90 per cent of women were trying to put on weight, using strategies ranging from special meals to steroid use.

Philosophers and artists have argued for centuries about what constitutes beauty. Is it an innate property of an object or person or does it depend solely on the mind of the observer?

Research has shown that beauty can to a large degree be measured objectively, though notions of personal beauty do vary by culture and period.

There has been a long tradition of associating beauty with good and ugliness with evil. Even now, being attractive can give us a head start in life and being 'different' can make life difficult.

From De Dio Cetal., PLoS ONE 2007;2(11):e1201.



Mathematical analyses can help identify features associated with beauty. The proportions of the classical sculpture of Doryphoros by Polykleitos (centre) match a well-known ratio. When this ratio is altered, extending the abdomen (left) or the legs (right), the resulting physique is generally rated as ugly. Interestingly, objective analysis of body form and subjective assessments of beauty seem to involve distinct areas of the brain.

## Hips do lie

We do seem to find slim figures appealing – though ratios seem to be more important. And it depends whether we are hungry or not.

In less politically correct times, women were often described in terms of their 'vital statistics' – chest, waist and hip measurements in inches.

Ironically, the strongest candidate 'beauty factor' in women is an echo of those vital statistics. Many studies have found that a **waist-to-hip ratio** of around 0.7 is judged most attractive. This is independent of overall size: both Twiggy and Marilyn Monroe had ratios of 0.7.

First suggested in the 1990s, the waist-to-hip ratio theory has been interpreted in an evolutionary context. Women with this shape tend to be healthier and more fertile, so could be seen as better mates.

## Sex discrimination

Overall, women tend to be less swayed by men's physical appearance, though body mass index, waist-to-hip and, in particular, waist-to-chest ratio influence perceived male attractiveness. A recent study of choices in speed dating found that women were more discriminating than men (who tended to select partners simply on physical appearance), going for overall desirability as a mate. This is also consistent with an evolutionary explanation.

Nonetheless, social and cultural factors will influence these preferences. For example, it appears that low socioeconomic status and even hunger increases the perceived attractiveness of larger people. This may be why some non-Western cultures are more likely to see larger sizes as attractive.

## 'Darling, you're so average...'



**MANCHESTER UNITED:** An average female Mancunian from Nowgen's 'Faces of Manchester' project.

### The key to beauty? Symmetry and 'averageness'.

'Beauty is in the eye of the beholder', as the saying goes. But not entirely. We mostly tend to agree who is attractive and who is not. So are there objective measures of human beauty? Or biological reasons why certain faces are seen as attractive?

For a long time, **symmetry** has been thought to be important to beauty. This was first noticed in scorpion flies: those with the most symmetrical wings were most successful in mating. In studies on people, those with the most symmetrical facial and bodily features were rated the most attractive.

The reasoning has been that symmetry is an indicator of good genes and good health. All kinds of stresses will tend to break symmetry, so maintaining symmetry is evidence of high resilience – very attractive to a prospective mate. We do not consciously assess symmetry – it seems to be hard-wired into our brains.

Another feature thought to correlate with beauty is **averageness**. When faces are blended to create an average, it is generally rated more attractive than the individual faces from which it is composed.

However, if just attractive faces are morphed, then compared with an unselected average, features specific to facial attractiveness emerge. If these are exaggerated, the composite is considered to be even more attractive – 'better than average'.

The fact that a computer can be taught to recognise attractiveness in human faces reasonably well indicates that beauty is, to at least some extent, an objective measure.



**WAIST AWAY:** Extreme waist-to-hip ratios were fashionable in the 18th century, as this satirical etching illustrates.

## Colour me bad

Skin colour fashions come and go, but both darkening and lightening pose a threat to health.

Skin colour varies dramatically between humans, from almost black to almost white. It is determined by a pigment in the skin called melanin (see page 7).

Until the last century, in Europe and Asia, lighter skin was perceived to be beautiful. The Romans and Greeks used lead paints and chinks to whiten their skin, as did people in Elizabethan England. The Japanese have idealised 'bihaku' (beautiful white) skin for centuries: women protected themselves from the sun with parasols, scrubbed their skin with 'nuka' (rice hulls) or ground pearl from seashells into powder for swallowing to whiten their skin.

White skin was viewed as a symbol of innocence and purity – and more importantly of wealth, education and status. Peasants and farmers worked outside and grew dark under the sun, while the wealthy lived indoors, protected from its rays.

In 1920, **Coco Chanel** sported the first tan, having stayed out too long on a yacht in the Mediterranean, and a new fashion trend was started. Rather than signifying poverty,



Jonathan Hordle/Flex Features

© Barbara Watton/epa/Corbis



a tan now became an emblem of the rich and fashionable, who could afford holidays in the sun. Sunbathing was also promoted as part of a 'healthy lifestyle' in the interwar years, to counter diseases such as TB and rickets.

With the health risks of sun exposure now well known – or perhaps it is the loss of social exclusivity – the desirability of a rich tan may now be on the decline. Even so, people in the UK spent £40 million on tanning products and sunbed sessions in 2005, and half the adult population say they feel healthier with a tan. Cancer Research UK estimates that sunbed use can double the risk of skin cancer and causes about 100 deaths a year.

### Lighten up

Meanwhile, many women with African ancestry are aiming to lighten their skin. Lotions developed for medical use have been popular, but many contain a bleaching chemical called **hydroxyquinone** – now banned in the UK (though still obtainable illegally).

Perhaps more alarmingly, use of skin-lightening products by women is common in sub-Saharan Africa. Studies in Dakar, Senegal, for example, suggest at least a third of women (possibly much higher) are using hydroxyquinone, steroids or other chemicals. In many countries, use of skin-lightening agents, including mercury-rich soaps, is a significant public health problem.

## Looking good

Is our concern about our appearance mere vanity – or does beauty confer social advantages?

We may feel that looks don't matter in most walks of life, but the evidence suggests otherwise.

Being tall, for example, seems to be an advantage. Short people tend to get paid less and short men (but tall women) are less likely to marry and have children. This may reflect direct discrimination or the impact of bullying (small children are more likely to be bullied) on self-esteem or the result of a small correlation between height and intelligence (probably linked to better nutrition).

As for good looks, workers of above-average beauty earn about 10 to 15 per cent more than workers of below-average beauty (though figures differ markedly between countries).

Other research suggests attractive patients receive more personalised care from their doctors, and good-looking criminals receive lighter sentences than their less attractive peers. In a study of Finnish elections, attractive candidates were more likely to be successful.



Alexander Hatemann/Stockphoto

So are good lookers simply better than the rest of us? There is some evidence that attractiveness is linked to intelligence but social factors are likely to be highly influential. Attractive children are more popular and better adjusted, and teachers give attractive children higher marks, as well as having higher expectations of them. Attractive adults tend to have higher self-esteem and self-confidence.

And thanks to the 'halo effect', people judged highly in one area – attractiveness – are also rated positively in other ways, even without any evidence of competence in that area.

## HOTTENTOT VENUS

Born in 1789 in South Africa's Cape Colony, Saartje Baartman was brought to England in 1810 by a British Army Medical Officer, who saw an opportunity to make money by putting her on show, exploiting her distinctive, large buttocks, typical of Khoisan people. The 'Hottentot Venus' became an instant celebrity. Pored over by the public and physicians alike, her indignities did not end with her death: her skeleton, preserved genitals and brain were displayed in Paris's Musée de l'Homme until 1974. In 2002, her remains were returned to South Africa, at the request of Nelson Mandela.


The Hottentot Venus is a potent symbol of Europe's lurid fascination with Africa and womanhood. She was dressed provocatively, the personification of lust and powerful, primeval emotion. She also stands as testimony to the appalling mistreatment of Africa and Africans.

In her day, Saartje Baartman would not have been seen as unusual. Today, a large posterior may be perceived as a celebration of African womanhood – in Ivory Coast, the hit song 'Bobaraba' ('big bottom') has swept the nation. Even Ivory Coast footballers adopted the dance during goal celebrations during the African Cup of Nations.



# REAL VOICES

What is it like to be 'different', physically? Or to want to change your appearance? How do other people's reactions affect the way we behave? Should we just make the most of what we are or think about changing ourselves to enhance our appearance? Three women with contrasting circumstances put forward their point of view.



**Henrietta Spalding**, of the charity Changing Faces, has a facial paralysis condition.

## What are the symptoms of your condition?

I have Moebius syndrome. It's caused by a lack of full development of cranial nerves, causing paralysis of the face and eye muscles.

My eyes don't close, and they don't move from side to side. That means I have to move my head to read and I can't see how fast a car is coming when I cross the road. But the body is amazing, I've developed the most acute hearing, and I can tell how far away a car is by listening to it.

The most prominent feature is paralysis of the face: we have no expression, and have difficulty eating and speaking (my lips don't close so there are sounds I can't make).

## What situations do you find most difficult?

None. My teenage years were harder. At school some people weren't informed and had unhelpful behaviours. I wasn't bullied, but I was left out. But when I got to university I was taken for who I am, I worked in the union bar and had a great time.

## How do you find people react to you now?

I'm very privileged, I have a huge set of friends and I meet people on a daily basis, through work and my interests. But I do have to make a bit of an effort to put people at their ease. I'm keen they see the real Henrietta Spalding, the person I am.

## How do you wish they would react?

As they do.


## How do you think society treats people 'out of the ordinary'?

People might be curious, or uncomfortable, or unsure. We live in a world where people feel easier being similar. People don't know how they're supposed to react to people who look a bit different: they might be uninformed or ill-equipped. They're not often cruel, just the occasional person.

## Do you think physical appearance has too much significance in modern society?

Yes I think it does. It's unfortunate. The definition of what's acceptable has become more and more narrow. The impact on people's lives can be huge. It doesn't need to be that way.

**Nichola Dean**, a researcher for the BBC, has achondroplasia, a form of dwarfism.



## How does your condition affect your life?

I've got achondroplasia, which is a form of dwarfism or restricted growth. We're quite happy with the term 'dwarf'. I'm a lot shorter than average: 4 feet 2 inches.

I've got the same life as everyone else, but I can't reach everything. For example, I've just moved into a new home, and everything

in the kitchen is too high. We need car-pedal extensions to drive. And cashpoints can be awkward.

So there's a practical impact. We have to adapt to the world, it's not the other way round.

## What situations do you find most difficult?

People staring, sometimes even pointing. Some people find it funny, I still get shocked by that. It's partly the fault of the media, stereotyping dwarves. And partly people who aren't happy with themselves, using playground tactics.

That is getting better though, and there's no point getting angry. For every one person doing it, there are 100 that aren't.

## How do you find people react to you now?

I've been to university, I work at the BBC. I never came across any discrimination in those worlds. As long as I can do the job, my height isn't a problem. I can sense if someone wants to ask about it, and tend to mention it first.

## How do you wish they would react?

I wish they wouldn't react. I'd love there to be a time when my kids can go anywhere and no one reacts. Racism has moved on, no one falls silent and stares if they see an Asian or African person. I hope it's the same with dwarfism in 20 years' time.

## Have you or would you consider treatment?

No, never. The leg straightening was due to pain. I disagree with leg lengthening. I'm happy with who I am, I'm pro-difference. We can't all look like everyone else. People should be different.

## WHAT SITUATIONS DO YOU FIND MOST DIFFICULT?

**HS** At school some people weren't informed and had unhelpful behaviours. I wasn't bullied, but I was left out. But when I got to university I was taken for who I am, I worked in the union bar and had a great time.

## HOW DO YOU WISH THEY WOULD REACT?

**ND** I wish they wouldn't react. I'd love there to be a time when my kids can go anywhere and no one reacts.

**Jan Upfold, a market researcher, has undergone cosmetic surgery on several occasions.**

### What have you had done?

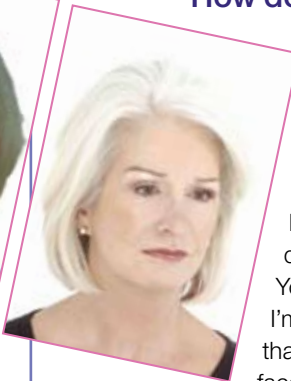
I had a full facelift from the chin upwards, including liposuction under the chin to redefine my jawline. I had my jowls lifted and tucked behind my ears, and the side of my face tucked back in front of my ears. Skin from my brow was pulled up and tucked under my hairline to remove my frown lines.

Then I had fat taken from my belly and injected into the mannequin (nose-to-mouth) lines on my face and above my top lip, to fill out the fine lines there. And I had Botox for my smile and frown lines. I will have to have the Botox and infills redone, for maintenance, every six months or so.

### What made you want to have this done?

In my profession – I work as a market research interviewer – as you get older, as a woman, your opinion is less valued. Once you're 50 you become a bit invisible. The facelift makes me more marketable, employable, more worthwhile professionally.

It doesn't relate to wanting to get a man. I'm very happily married, and my husband loves the results. He likes showing me off to his friends.



### How do you feel about the results?

Very happy. The vast majority of people who have facelifts want to look young. But my main criterion is just to look better. I look normal. Attractive, but ordinary.

People talk about a facelift making you look 'ten years younger'. Well, on a good day, in reality, I only look five years younger. You might think I was in my early 50s, when I'm nearly 58. If you want to look younger than that, you end up with the obviously lifted face, the horror stories.

### What impact have the procedures had on your life?

It cost a lot of money, around £16 000 all together. Since this surgery, we've had no major fantastic foreign holidays. It's a choice, what you spend your money on. Some people choose a BMW. I chose my face.

My friends and lifestyle haven't changed. A facelift doesn't change your life. Feeling confident about yourself usually does.

### Do you think too much emphasis is placed on appearance these days?

Yes, on appearance and stereotype. Young people have to wear the designated outfit or they're not cool. Certainly in the young it's unhealthy. That's where it starts.

Henrietta, Nichola and Jan talk more about their experiences in three short films at [www.wellcome.ac.uk/bigpicture/howwelook](http://www.wellcome.ac.uk/bigpicture/howwelook). Big Picture Online also includes longer versions of these interviews.

## Image Lab

The classroom activity to accompany this issue of *Big Picture* explores the science or pseudo-science behind a number of beauty products.

In 'Image Lab' students will find out how beauty products work and make their own videos advertising or scrutinising them. Films produced can be entered into a competition for the chance to win top prizes.

A guide to producing videos, background information, lesson sheets and teacher notes can all be found online at [www.wellcome.ac.uk/bigpicture/howwelook](http://www.wellcome.ac.uk/bigpicture/howwelook).



The activity is free to download and is relevant to the post-16 specifications in

England, Scotland and Wales.

So to be in with a chance of winning up to £1000 to spend on film equipment for your school, make sure you get entries in by 26 October 2008.

Further details available on the website. The activity has been designed by a collaboration between three science centres: Techniquest, Glasgow Science Centre and Thinktank.



ONLINE ACTIVITY

# IT'S THE FUTURE



What might we look like? How might we change the way we look? *Big Picture* examines some potential scenarios that could be coming our way very soon...



THE UNIVERSE, Wednesday June 5, 2012 15

## Android activists attack

ANDROID rights campaigners have reacted with horror at the news that Cyril Cyberfan is to 'wed' his third gynoid.

Fembot feminists have condemned his actions as showing no respect for smart machines and called for more legislation to protect the rights of what they call 'non-human life forms' – nhu-lives.

"Nhu-lives are every bit as intelligent as the people who own them," argues fembot campaigner Alana Turing. "It's not right that people should be able to exploit them in this way."

ship certificates to formalise a relationship with a synthetic life form, though only those of the 'LuvMe' class of androids and gynoids which have been specially developed to act as life partners.

Speaking from his home in Leeds, Europeania, Mr Cyberfan, 53, said that his relationship with his first two gynoids had irretrievably broken down. "Sindy and Sandy just don't do it for me anymore," he explained. "And the new series 4000 models from CyberChix Inc have the most amazing programmable control units."



netic algorithms built into new-generation nhu-lives are so sophisticated that they imply that the creations must have a rich inner life akin to emotions.

Mr Cyberfan was unrepentant yesterday. "I've just put Sindy and Sandy on standby in the spare room. They seem perfectly happy."

### BREAKDOWN

Since 2025, people have been able to apply for civil relation-

### A REAL TURN-OFF

Campaigners have argued that the behaviour-mimicking ge-



POSTED BY BARRY MERRICK, 23 MARCH 2017

### BeautyWear get comeuppance - at last



It was great to hear that those beauty fascists at BeautyWear have become the first company to be prosecuted under the Aesthetic Discrimination Act (2016). They argued that they were selling "beautiful products sourced in a beautiful way" and hence needed to have attractive people serving in their hard-life shops and gorgeous avatars in their Second Life, iUniverse and GoogleWorld virtual franchises.

What smoki! It was clear a decade ago that people who did not conform to society's ideals of attractiveness were being unfairly discriminated against in all walks of life. It took the explosive growth in cosmetic enhancement procedures and alarming rise in young people's mental health problems for the issue to be taken seriously. Even now, the proportion of plain people on the BBC is far lower than in the general public – there's still a long way to go before we rid our society of this ridiculous prejudice. Only the other day I was walking in the car-free zone of Mandelaford Heights when I heard two girls describe a third as "ugly as sin". I honestly thought language like that had died out years ago...

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### SEARCH


# Let's do it!

**"I'm really proud of my great-grandmother" Carolc, 20**  
Full story on page 10

**Mother of four Isabella Fecundorilla spoke to Let's Do It! about her decision to have another child at the age of 82.**



**"IT'S GREAT TO BE A MUM AGAIN!"**

Looking at Isabella Fecundorilla radiant and blossoming in the early stages of pregnancy it is hard to believe she's at an age when women used to be settling down to a hard-earned retirement. She's never felt better, she says, and it's easy to believe her. She's still coming to terms with her new-found celebrity status as the world's oldest mum, but suspects that it is not an honour she is likely to hold for long.

Back in the 'bad old days', as she calls them, doctors realised that something strange was happening in ageing. In the early 20th century, average lifespan increased as the causes of early mortality – infectious disease, malnutrition – were overcome. Later, longevity continued to increase as the conditions of later life were tackled more effectively. By the early 21st century, life expectancy was increasing by more than five hours every day.

Remarkably, this trend continued as researchers realised that tackling the causes of biological ageing would benefit a host of later-life conditions.

[cont on page 23]  
By Rosie Futures

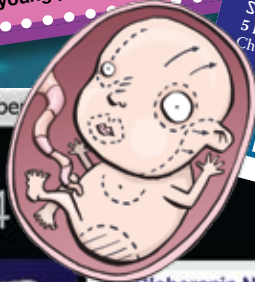
"I don't look old and I don't feel old," says Isabella, whose mother lived to be 124. **"Why shouldn't I do all the things young people do?"** ...



**Day 1**

- 100 m heats for Permanently Genetically Enhanced Athletes
- 100 m heats for Genetically Untreated Athletes
- 100 m heats for Mechanically Enhanced Athletes
- SWIMMING: 5 km underwater freestyle for Chemically Enhanced Swimmers
- 24-hour ultra-marathon for Elite Endurance Permanently Genetically Enhanced Athletes
- Long jump for Genetically Untreated Chemically Enhanced Athletes
- Very long jump for Mechanically Enhanced Athletes

**"FASTER, STRONGER, HIGHER!"**



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Globberania News 24 (transcript live)

**TV newsreader:** "...Scunthorpe 4, Arsenal 0. And finally, a story about one couple's efforts to give their daughter the best possible start in life. Felix Mandible reports."

**Felix Mandible:** "We all want the best for our children, but how far are we prepared to go? In the Espagnol Province of Europeania, Hattie and Mattie Moritz have ruffled a few feathers by opting for cosmetic enhancement for their daughter – while she is still in the womb."

**Mattie Moritz:** "Little Pattie is the most important thing in our lives and we want to make sure we provide her with all the advantages we can. We can send her to a good school and make sure she eats well, and I've been very careful throughout the pregnancy to eat properly and avoid things that might harm her. But we looked at the miracles that can be done with in utero surgery and thought, 'well, why not give her a flying start?'"

**FM:** "But do you think it is right to do this kind of thing?"

**MM:** "Well, cosmetic procedures are very common these days, and in recent years it's been tried in younger and younger people. It's pretty routine, really. And if we do it while she's in the womb, it will be painless and the wounds will heal much better because there will be no scarring."

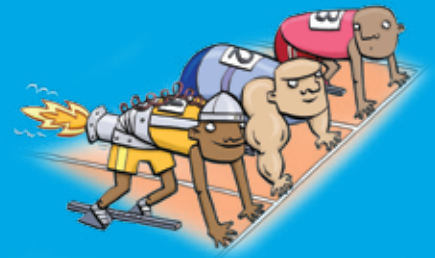
**FM:** "We asked leading medical ethicist Professor Romeo Beckham what he thought of the Moritzes' decision..."



Images: newspaper (Kokoro Company Ltd); others iStockphoto: 'MiteyMuscle' (Jamie Evans), 'Let's do it!' montage of pregnant woman (Ira Bachinskaya) and older woman (Andreas Reh); Olympiad programme torch silhouette (Paul Pantazescu); 'Globberania' montage of newsreader (Phillip Dyer), globe (Ufuk Zivana) and filming (Oktay Ortakcioglu); blog coathangers (Joseph C Justice) and mannequins (Anna Bryukhanova).

# HOW WE LOOK

## THE BIG PICTURE



- Human development depends on carefully coordinated control of **gene activity**.
- If mutations or chemicals disturb this **developmental programme**, people may show distinctive physical and mental traits.
- The genetic basis of a number of **physical traits**, such as height, weight and skin colour, is beginning to be determined.
- As well as being the site of our main sensory organs, the face is also important in **social communication**.
- The **brain** has special areas devoted to the face, and a range of information is drawn from faces.
- **Inferences** are drawn from faces very quickly and often automatically (but not always accurately).
- Thanks to better nutrition, humans have been getting **taller** over recent centuries.
- With energy intake now often exceeding energy usage, many populations are facing soaring rates of **obesity**.
- People of unusual appearance have been seen as **curiosities** for many centuries.
- Most attempts to link particular physical features with **character or personality** have failed.
- UK society is increasingly based on the principle that external appearance is unimportant, and should not be the basis of any form of **discrimination** against particular individuals or groups.
- Some objective measures of **beauty** have been identified, including degree of facial symmetry.
- **Waist-to-hip ratio** seems to be associated with perceptions of attractiveness in women.
- An **evolutionary explanation** is that features seen as attractive may provide insight into genetic quality.
- Historically, beauty has tended to be associated with virtue. This has often led to **stigmatisation** of people who do not conform to a society's notions of attractiveness.
- Throughout recorded time, people have attempted to **modify their appearance**, for a variety of reasons.
- Traits seen as desirable change according to social trends – generally, favoured traits are associated with **high social status**.
- **Cosmetic surgery** is becoming increasingly popular in the UK.
- Advances in **biomedical engineering** for tissue and organ repair may offer new ways for people to alter their appearance.

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