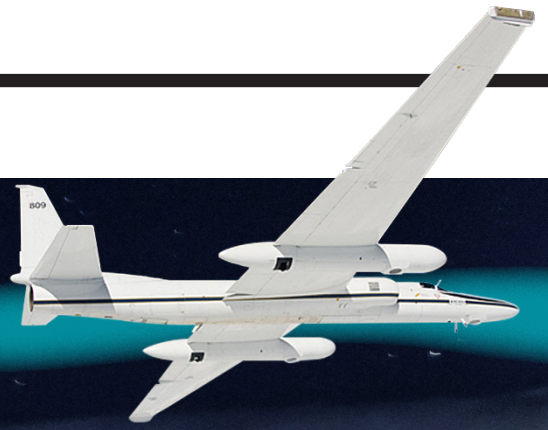




NASA's modified spy plane can collect samples from the atmosphere at altitudes of 20+ km.



Spy plane monitors huge storms

NASA has developed a modified U-2 spy plane to find out, if climate change is destroying the ozone layer above the US.

METEOROLOGY Huge storms can cause new holes in the ozone layer, NASA scientists warn. According to their theory, the giant storms force air pollution and water vapour to altitudes of 14+ km, where both threaten to break down the ozone that protects us against hazardous UV radiation from the Sun. Scientists aim to test the theory by means of a modified U-2 spy plane, which can fly to the required altitudes.

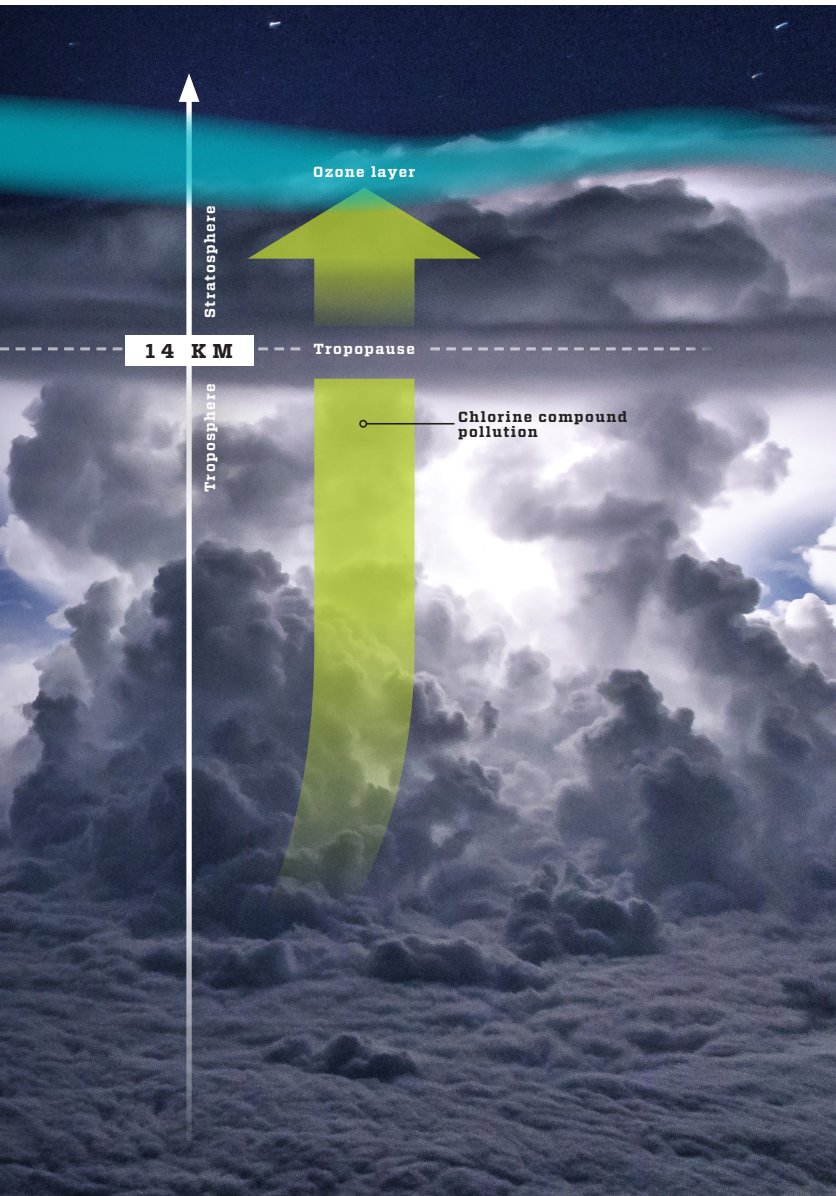
The 14 km boundary is also known as the tropopause, and meteorologists used to think that only very few storms were sufficiently massive to reach this high. So, they have not been considered very important to the ozone layer, but the huge storms, which meteorologists have named "overshoots", now prove to be much more common. Moreover, the warmer climate means that there will be more of them. New studies show that there are some 45,000 annually – above the US alone.

When a storm brings water vapour and chemicals to the ozone layer, the sunlight could cause chemical reactions that break down the chemicals into smaller constituents. Chlorine could be liberated, which is poisonous to the ozone layer. One

single chlorine atom might trigger a vicious circle, by which one ozone molecule after the other is broken down.

An ozone molecule is made up of three oxygen atoms, and in short, the chlorine atom steals one of them, so only one ordinary oxygen molecule is left, that consists of two oxygen atoms. However, the chlorine atom does not hold on to its oxygen atom for very long. As it meets with a free oxygen atom, the chlorine atom liberates its oxygen atom again and is ready to attack another ozone molecule. In this way, one single chlorine atom can destroy tens of thousands of ozone molecules.

The spy plane can fly as high as 20 km and is hence ideal for monitoring the upper layers of the atmosphere. In the years to come, the plane will seek out the huge storms and take samples of the air to study the contents of water vapour and chemicals. The temperature will be recorded, and according to the NASA scientists' theory, the chemical reactions above the tropopause could be sped up by higher temperatures. So, the warmer climate could threaten the ozone layer in several ways at the same time.



Chlorine is ozone layer poison

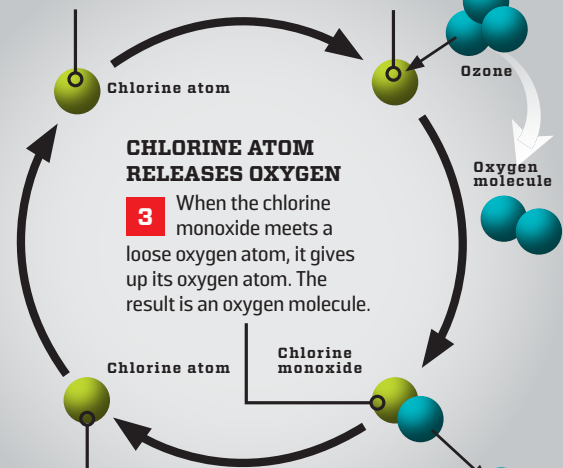
Scientists fear that major storms force pollution including chlorine compounds to an altitude of 14 km, triggering a vicious circle that breaks down the ozone layer.

ONE CHLORINE ATOM STARTS THE PROCESS

1 When chlorine compounds are dissolved in the stratosphere, free chlorine atoms are allowed to attack the ozone molecules.

CHLORINE ATOM STEALS OXYGEN

2 The free chlorine steals an oxygen atom from an ozone molecule, turning into chlorine monoxide. One oxygen molecule remains.



CHLORINE ATOM RELEASES OXYGEN

3 When the chlorine monoxide meets a loose oxygen atom, it gives up its oxygen atom. The result is an oxygen molecule.

THE FREE CHLORINE ATOM REBOOTS THE PROCESS

4 The chlorine atom can now attack a new ozone molecule. So, ever more ozone is converted into ordinary oxygen.

Bread and porridge changed our language

ARCHAEOLOGY The agricultural revolution some 10,000 years ago has influenced modern language a great deal, according to research by the University of Zurich, Switzerland. The peasant diet is the very reason we use words including the letters of f and v.

Over generations, the peasant diet physically changed us. When our main menu began to consist of bread and porridge made with flour, it was no longer necessary for our lower jaw to grow very strong, and so, we now get to keep the overbite that all babies are born with.

In the very few cultures, that have kept their hunter-gatherer lifestyle, the overbite gradually disappears with age, as the lower jaw grows

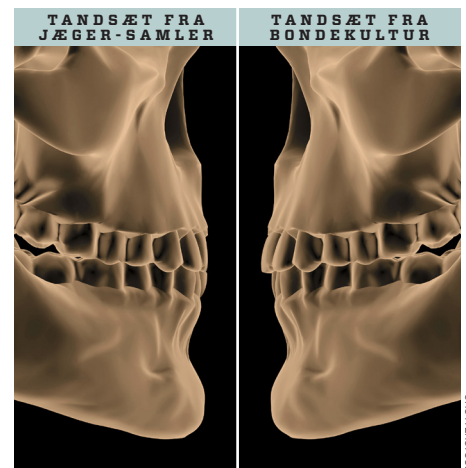
forwards, so the front teeth of the upper and lower jaws are finally aligned.

The letters f and v are labiodental consonants, which are easier to pronounce with an overbite. Indeed, it is 29 % easier, according to computer models developed by the Swiss scientists. More-

over, their studies showed that in agricultural cultures, there are four times as many labiodental consonants in the language as in the languages of modern hunter-gatherers. Mapping out of language relationships also showed that the new sounds became ordinary over a period of about 8,000 years. According to the scientists, the development might have been reinforced by the fact that the new sounds were status symbols.

Labiodental sounds

such as the letters of f and v are articulated with the use of the lower lip and the upper teeth.



Agricultural community soft food means that we keep our overbites throughout life, making it easier to pronounce v and f.



BY THE WAY



SPIDER ATTRACTS FEMALES WITH OPTICAL ILLUSION

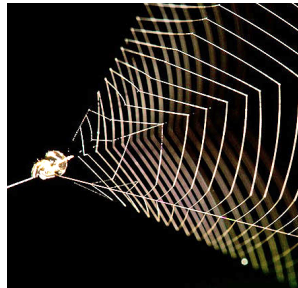
Male peacock spiders attract females with their dazzling colours – but they are just an illusion. Biologists have discovered that the colours only seem so bright, because they are seen in contrast to black areas that absorb 99.5 % of the light that hits them.

JÜRGEN OTTO

AND TALKING OF SPIDERS ...

SPIDER HUNTS WITH SLINGSHOT

South American spiders of the Theridiosomatidae family use their web as a slingshot. When prey approaches, the spider cuts off a safety thread, so the web and itself are flung forwards. Scientists have now calculated that it happens with an acceleration of 100+ g. Humans can only tolerate up to 6 g.



JEFF ORSHNER

SPIDER VENOM CURES IMPOTENCE

Some spiders hunt with venom that makes the prey's heart stop. But the venom can also be very invigorating. Scientists have produced a synthetic and harmless type, which is a good measure against impotence. The venom makes the tissue of the penis relax, so blood can more easily flow to cause erection.



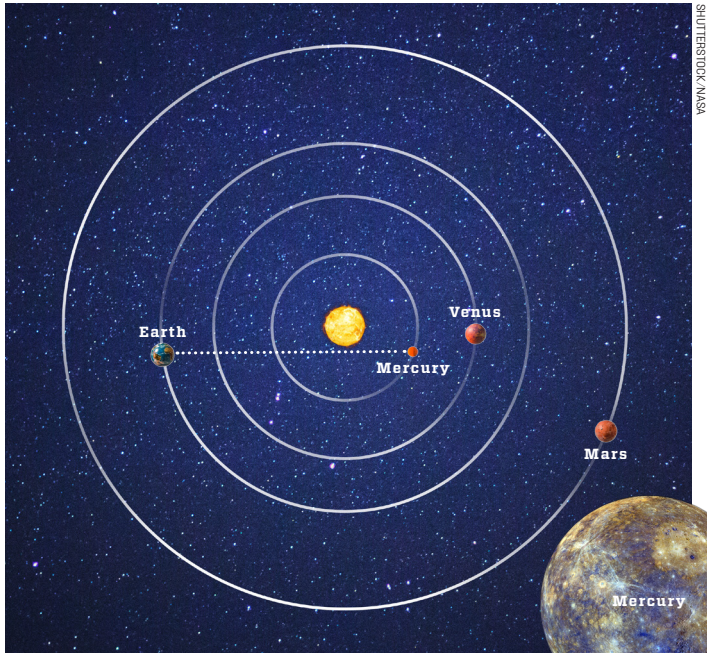
SHUTTERSTOCK

ELECTRICITY MAKES SPIDERS FLY

Several spider species can travel long distances by producing a long thread and letting themselves be carried by the wind. Much to their surprise, biologists have discovered that it also happens, when there is no wind. It turns out that the creatures use weak electric currents in the atmosphere to fly.



SHUTTERSTOCK



SHUTTERSTOCK/NASA

Most of the time, Mercury is Earth's closest neighbour – for instance when the planets are located like this.

Mercury is the closest neighbour of all Solar System planets

ASTRONOMY If you are asked, which is Earth's closest neighbouring planet, you will probably say Venus. If you look it up in an encyclopedia or ask an astronomer, you will presumably get the same answer. But it is not correct, according to a computer programme developed by three American engineers from NASA, etc.

Whereas books of reference and experts usually base their answers on the distance between the planets' orbits, the computer programme does something else. It simulates how Solar System planets are located in their orbits over a period of 10,000 years, and so, the programme can calculate the average distance between two planets very accurately.

Averagely, the distance from Earth to Venus is 1.14 astronomical units (AU – one AU is the distance

between Earth and the Sun, i.e. some 150 million km). But the distance between Earth and Mercury is only 1.04 AU. so the Solar System's innermost planet is usually closer to us than Venus. It is also closer than Mars, which is probably surprising to most people.

And even more amazing: the simulation shows that over time, Mercury is the closest neighbour of all Solar System planets – even also of the dwarf planet of Pluto.

Apart from disproving old dogmas, the engineers' computer programme can be used for practical purposes. It can provide a quick overview of the locations of satellites of different altitudes as compared to one another over a long period of time. This is important, if the satellites are to be in direct contact with each other.

15 million km

- is how much closer Mercury is to us than than Venus, according to a new computer programme.

Diehard robot tolerates free fall of 180 m

TECHNOLOGY A robot shaped like a transparent football could become a vital tool for rescuers in disaster zones. It tolerates being parachuted from helicopters or drones at an altitude of 180 m. When it lands, it can roll over and record footage, so rescuers are prepared to enter the zone themselves.

The robot was developed by scientists from the University of California in cooperation with the Squishy Robotics company. It consists of a core, in which all electronic components are protected. Around the core, there are six rods that all include shock absorbers, and their ends are linked by steel wires. The robot's core is hence surrounded by a large shock absorber, which protects it, no matter in what direction it is facing, when it hits the ground.

Small motors in the core can tighten and relax the wires to make the robot's exterior change shape. It moves the robot's centre of gravity, making it roll across the surface.

The robot comes in several sizes, depending on its mission. Apart from cameras and radio transmitters, it can be equipped with different sensors, which can measure, if there are any toxic or explosive gases in the disaster zone.

The robot was developed with support from NASA, and the long-term aim is to use it on Saturn's moon of Titan. According to plan, it is to be launched towards the surface from a satellite, but quite a lot of development remains to make it tolerate a fall from such an altitude.



SIX SHOCK ABSORBERS PROTECT THE CORE OF A NEW ROBOT, SO IT CAN SURVIVE FALLS FROM HIGH ALTITUDES.

Phone checks kids' ears

A new app and a paper cone quickly and easily reveals inflammation of the middle ear.

MEDICINE Earache is the most frequent reason for kids to see a doctor – and that makes perfect sense, as there is not much else the parents can do.

Scientists from the University of Washington aim to change that. They have developed a phone app that can reveal fluid accumulation in the middle ear. Middle ear inflammation is often caused by an infection that makes liquid collect behind the eardrum, and it is the liquid pressure on the inside of the drum that causes the pain.

The app uses the phone's speakers and mike, and the only thing otherwise needed is a tiny funnel made of paper in the same way as a cone. The pointed end of the funnel is placed in the kid's



A PHONE APP AND A PAPER CONE REVEALS LIQUID BEHIND THE KID'S EARDRUM.

external ear, and the phone's mike is placed at the wide end of the funnel. The app emits a series of brief sounds similar to bird chattering. The sounds are reflected by the eardrum back to the phone's mike, and the app has all the data it needs. The sounds from the speaker and the reflected sounds interfere, and the interference pattern shows if there is liquid behind the eardrum or not.

In experiments with 53 young kids, who had been taken to the doctor with earache, the app revealed the liquid. In 85 % of the cases, it came up with the correct answer, and that is just as good as what an otologist can manage. The experiments also showed that the app functioned equally well with a number of different mobile phones.

Acoustic image reveals ear inflammation

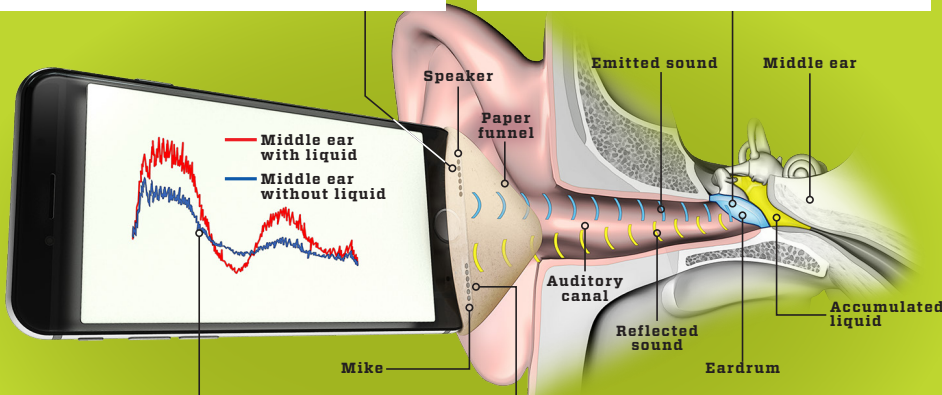
Inflammation of the middle ear is caused by infection that makes liquid accumulate behind the eardrum. A new app can reveal the liquid, if any.

SPEAKER EMITS SOUND

1 Sound from the phone's speaker travels through the funnel into the auditory canal.

EARDRUM REVERSES THE SOUND

2 The sounds reach the middle ear, in which they are reflected by the eardrum.



PATTERN MAKES A DIAGNOSIS

4 The sound waves' total pattern shows any fluid accumulation in the middle ear.

MIKE RECORDS THE SOUNDS

3 The emitted and reflected sounds merge to be recorded by the mike.