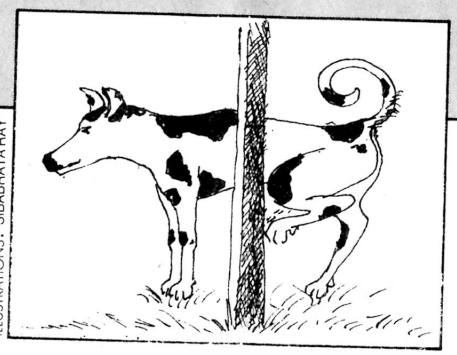
CURIOSITY CORNER

PRIZE WINNER Rs. 100



ILLUSTRATIONS: SIBABRATA RAY

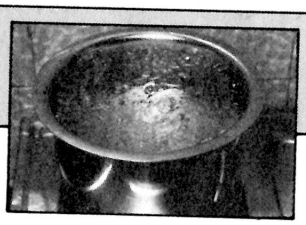
Why do dogs frequently urinate on pillars and posts?

SUNIL KUMAR, CALICUT

The tendency of dogs to 'irrigate' pillars, lampposts, mailboxes, trees, hedges etc. owes its origin to a very basic and deeply ingrained territorial instinct. The urine of dogs, and other species of animals contains specific chemicals which serve as distinctive personal markers due to their smell. Called pheromones, they can be described as chemical messengers. Earlier it was thought only insects relied on pheromones; but now it is recognized that other animals including mammals also use them. Dogs, particularly, are preadapted for their extensive use on account of their proverbially acute sense of smell. In 'anointing' any and all landmarks—trees, pillars, etc—the animal simply demarcates and defines its territory, or 'home ground'. Even mobile objects such as cars, scooters, bicycles, etc, especially of the master's household may also be regularly 'marked' to reassert 'ownership'.

The 'markings' also serve as olfactory memories or homing beacons. However, their primary, time honoured function is usually the aggressive reassertation: "Beware! This is mine!."

R.N. SHARMA, ENTOMOLOGIST, NATIONAL CHEMICAL LABORATORY, PUNE



Photographs: B.C. Chanda

Why does water lose its taste when it is boiled and cooled?

P.J. JOSEPH JOHNSON, BANGALORE

The taste of drinking water is due to the small amounts of soluble substances present in it. Rain water during its descent absorbs carbon dioxide from the atmosphere. When it seeps through the soil, especially through lime stone strata, it converts the insoluble calcium carbonate to soluble bicarbonate and carries it into wells, steams, lakes, rivers or reservoirs

The taste of drinking water obtained from the above sources is due to these bicarbonates. Dissolved carbon dioxide and chlorine used for water purification also contribute to the taste.

When water is boiled, the gases escape. Loss of carbon dioxide pushes the reaction in the backward direction and the soluble bicarbonates separate out as insoluble carbonates which get deposited on the walls of the container. Devoid of all these solutes, water becomes tasteless.

R. M. SATHE, HONORARY PROFESSOR, D. G. RUPAREL COLLEGE, BOMBAY

Why does a chalk make a squeaky sound when not held at a correct angle?

A.MAJUMDAR, WEST BENGAL

While writing on a board, a chalk-stick is pressed on the board and moved horizontally. The friction between the chalk and the board removes the chalk particles from the chalk-stick and the particles stick to the board.

The movement of the chalk is governed by friction. If it is less, the chalk slips and vibrates, touching the board several times in rapid succession. This gives rise to the squealing noise. If there is sufficient friction, the chalk sticks to the board without slipping and there is no squealing.

Now, the friction between the chalk and the board depends upon the inclination of the chalk with the board. The smaller the inclination, the greater the friction. The squealing occurs if the inclination is large. If the chalk is held perpendicular to the board, one is sure to get the squealing noise.

HOMI BHABHA CENTRE FOR SCIENCE EDUCATION, BOMBAY

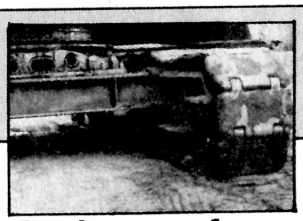
What is the discharge that runs from our nose when we have a cold?

M.V.R. KUMAR, JABALPUR

Common cold causes an increase in the discharge from the secretory cells of the nose so as to protect the nasal wall against the invading virus. The secretions are mainly mucus, 80 per cent of the dry weight of which is glycoproteins (a protein and a sugar chain linked together). The glycoproteins may be further attached to an acidic or a neutral 'tail' —either sialic acid or a sulphate group or fucose. The protein portion of the glycoproteins contains several amino acids.

Other substances present in nasal secretions (wet or dried) are, for instance, lactoferrin which binds iron and prevents the growth of certain bacteria. And lysozymes, some produced by nasal mucosa, and others originating in tears and sent to the nose through the nasolacrimal duct joining the lower eyelid with the nasal passage. The lyozymes dissolve the bacteria, which lack protective capsules. Nasal discharge also contains antiproteases of unknown function. Similarly, several phospholipids and triglycerides are present along with immunoglobulins (proteins which fight infection). In addition, there are many cells including surface epithelium, basophils, eosinophils and leucocytes. In dried mucus there are entrapped dust particles as well.

ANIL AGGRAWAL, MAULANA AZAD MEDICAL COLLEGE, NEW DELHI



Is there a simple way of removing rust?

ALOK JAIN, SURAT

Rust is a patch or film of hydrated iron oxide formed on the surface of iron when exposed to air and moisture. Since the film is superficial, it can be removed by physical means, that is, by rubbing the surface with a suitable polish paper. One can also use a liquid of low surface tension which would penetrate below the rusted patch and loosen the adherent films. Light scales can be removed by using a basic solution of a sequestering or solubilizing agent like EDTA (ethylene diamine tetraacetic acid). A more drastic treatment would be the use of dilute hydrochloric or phosphoric acid.

R. M. SATHE, HONORARY PROFESSOR, D. G. RUPAREL COLLEGE, BOMBAY

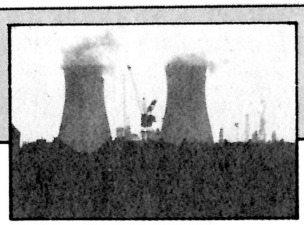
Why do some parts of the muscle 'dance' sometimes?

KUMAR B.N., JOGFALLS

The ancients noticed the dancing or twitching of muscles and to them it appeared as if a small mouse was moving beneath the skin. Indeed, 'muscle' is derived from *musculus* which is Latin for little mouse.

Muscle contraction is normally brought about by nerve impulses. However, sometimes individual muscle fibres twitch because of local factors such as poor blood circulation, exposure to cold, slight injury, or even heavy sweating which can cause disturbances in salt concentrations around the muscle. A muscle twitch is sometimes associated with abnormal nerve impulse from the brain. Such muscle twitches are known as tics. This is, however, a pathological condition.

ANIL AGGRAWAL



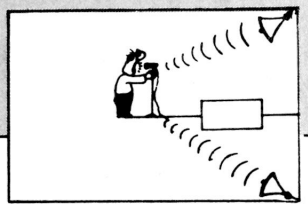
Does a coal fired power plant release more radioactivity than a nuclear power plant?

A. D. MALLESWARA RAO, IBRAHIMPATNAM

Coal contains trace quantities of naturally occurring radionuclides which arise from the radioactive decay of potassium-40, uranium and thorium. Combustion of coal, for power generation, results in the dispersion of radioactivity in the vicinity of the thermal power plant as fly ash from the stacks. This fly ash is enriched in radium and contains alpha-emitting radionuclides such as radium-226, thorium-228 and radium 228 which are bone seekers and can damage bone cells. The ash content of Indian coal is 30 to 40 per cent compared to the 10 per cent or less of good quality coal used in many countries.

Since about 60 per cent of the total power generation in India uses coal fired power plants, these plants contribute significantly to the total suspended particulate pollution leading to inhalation hazard. In comparison, gaseous emissions from nuclear power plants consist of tritium, krypton-85 and argon-41, which are not alpha emitters and hence are not as hazardous as the radioactivity contained in the fly ash.

SARADA GOPALAKRISHNAN, POLLUTION MONITORING SECTION, BARC, BOMBAY



Why do microphones screech?

VAIBHAV N. PAITHANKAR, THANE

In any public address system, sound waves are converted to electrical pulses in a microphone and the output of the microphone is amplified using an audio amplifier. The output of the amplifier is fed to loud speakers as shown in the figure. The intensity of the audio output or the loudness of the speaker depends on the gain set in the amplifier which can be controlled. Amplifiers are normally designed with an inbuilt gain much higher than is actually needed or used. This is then moderated by negative fed back, where a portion of the output signal is fed back to the input with a reverse polarity to reduce the gain. If, on the other hand, positive feedback is used, part of the output is fed to the input with the same polarity and it boosts the output. This is likely to produce unwanted oscillations, which are sometimes heard as a loud howling noise. This is due to output boosting the input, the input increasing the output, which further increases the input, and so on to uncontrollable levels. In public address systems this is caused by the sound from the loudspeakers (the output end) reaching the microphone (the input end).

One way to reduce this is to arrange loudspeakers at proper distances in such a way that sound waves from them to do not reach the microphone.

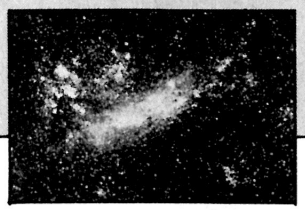
S.S. NADKARNI, TECHNICAL PHYSICS DIVISION, BHABHA ATOMIC RESEARCH CENTRE, BOMBAY

Walking barefoot in the grass is said to be good for the eye. Is it really so?

ABHIJIT BASU, PATNA

Many myths and superstitions are prevalent among the general public concerning eyesight. Many, for instance, believe that doing eye exercise or eating carrots improves eyesight and watching TV worsens it. Such beliefs have no scientific basis. At best, walking barefoot on the grass would do you no harm and at worst could give you hookworm infection. No remedy except for artificial appliances such as spectacles has been devised yet which could improve eyesight. Walking barefoot on grass, thus doesn't improve eyesight in any way.

ANIL AGGRAWAL

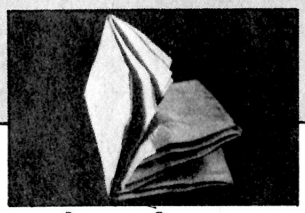


If there is vacuum in the Universe why are nearby celestial objects not sucked into it?

VINOD V.K., NASIK

For things to be sucked up by vacuum the main cause is the pressure gradient: things move from high to low pressure. In vacuum the pressure is zero and so things move towards it. In the cosmos the density of intergalactic or interstellar space is low everywhere and there is no large-scale pressure gradient and hence no large-scale motion of celestial objects. Where local inhomogeneities of pressure exist there is motion from high to low pressure areas.

JAYANT V. NARLIKAR, ASTROPHYSICIST, TATA INSTITUTE OF FUNDAMENTAL RESEARCH, BOMBAY



Why is that a piece of paper can be folded only seven times and not more?

RAJIB MUKHERJI, NEW DELHI

Paper is made of cellulose fibres and they are bent when it is folded. The fibres offer certain resistance to bending due to their elasticity. To fold a piece of paper certain force is required.

This force depends upon several factors. (i) It increases as the number of sheets to be folded increases. At each fold the number of sheets doubles. Thus at the seventh fold it becomes 2^7 or 128. The force required to bend increases proportionately. (ii) Bending a sheet of paper requires a bending moment to be applied at a certain distance from the line at which the paper is folded. The length of the sheet diminishes as the number of folds increases. The point of application of the force comes nearer and nearer to the axis of the bending moment. Consequently the force increases. (iii) At each fold, certain space is required to accommodate the additional sheets of paper. The space available decreases at each fold. Hence the inner sheets of paper offer a large resistance to bending further.

The number of folds varies with the density of the material of paper. A piece of thick paper may be folded only 4 or 5 times whereas a sheet of thin paper (tissue paper) may be folded even 9 times. One can try sheets of different materials and find the limit of folding for each of them.

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